

PROVINCE OF SASKATCHEWAN

**SASKATCHEWAN WATER RESOURCES COMMISSION**

AR49

**ANNUAL REPORT**

YEAR ENDING MARCH 31-1966







# ANNUAL REPORT

of the

## SASKATCHEWAN WATER RESOURCES COMMISSION

Province of Saskatchewan

FOR THE FISCAL YEAR ENDED MARCH 31,  
1966

Hon. W. ROSS THATCHER  
Minister

H. W. POPE  
Chairman

OFFICIALS  
of the  
SASKATCHEWAN WATER RESOURCES  
COMMISSION

THE HONOURABLE W. ROSS THATCHER  
Minister-in-Charge

**COMMISSIONERS**

H. W. Pope, Chairman  
C. D. Stewart, Vice-Chairman  
J. G. Clarkson, Member  
D. B. Furlong, Member  
W. H. Horner, Member  
W. R. Parks, Member  
J. J. Moore, Member  
G. C. Mitchell, Secretary

**CHIEF ADMINISTRATIVE OFFICERS**

C. D. Stewart, Executive Director  
G. C. Mitchell, Assistant Executive Director  
J. M. Crook, Director, Investigation and Planning Branch  
B. W. Boyson, Director, Water Rights Branch

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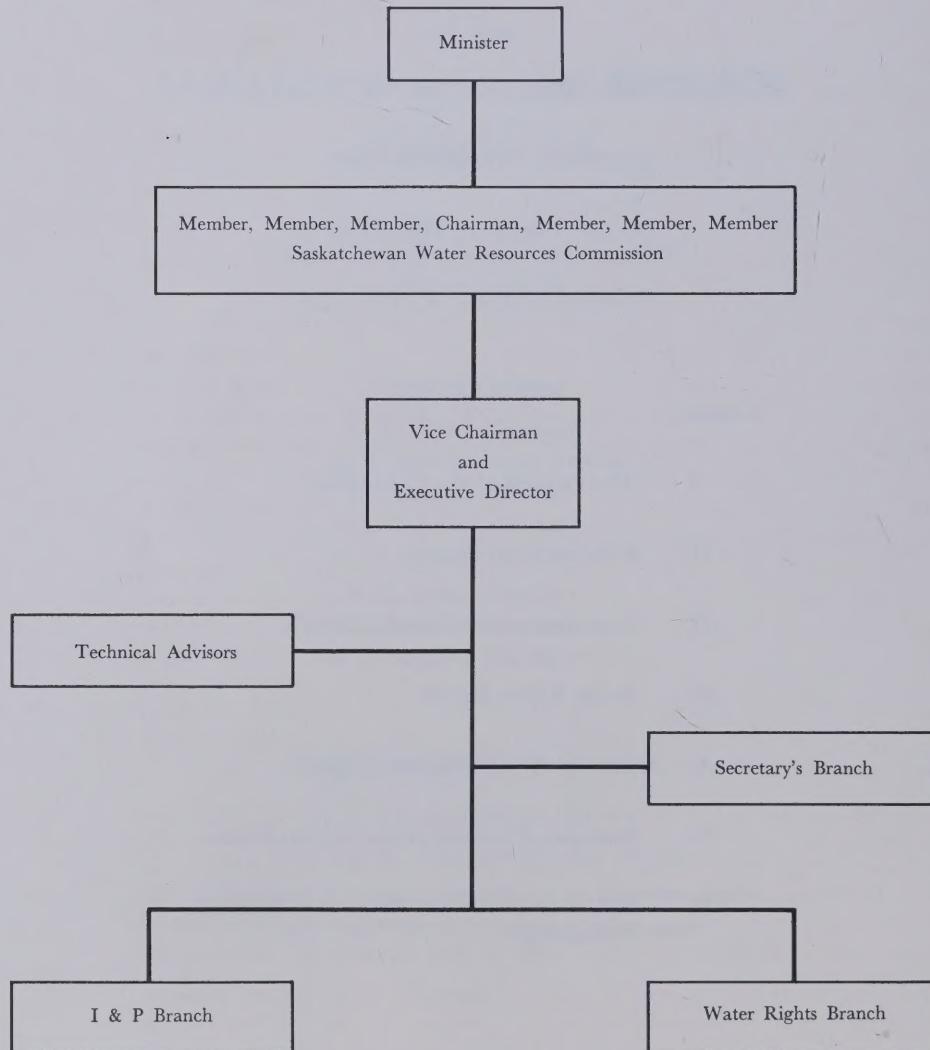
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ORGANIZATION OF  
SASKATCHEWAN WATER RESOURCES COMMISSION



# SASKATCHEWAN WATER RESOURCES COMMISSION

REGINA, SASKATCHEWAN,  
April 1, 1966.

To His Honour

THE HONOURABLE R. L. HANBIDGE, Q.C.,  
Lieutenant Governor of the Province of Saskatchewan.

SIR:

I have the honour to submit herewith the Annual Report of the Saskatchewan Water Resources Commission for the period April 1, 1965, to March 31, 1966.

The Saskatchewan Water Resources Commission, established on December 1, 1964, has completed its first full year of activity in advising the Government on water resource policy and development. In its first report, the Commission outlined in some detail the nature of its responsibilities and powers. It was further noted that the Commission planned to adopt a multi-use approach in the planning and development of this vital resource.

This multi-use approach is particularly well established in the Commission's study of the water needs of the Saskatoon-Southeast area and of alternative means of meeting these requirements. I am pleased to report that the Government approved the recommendation of the Commission that a multi-purpose water supply system be constructed in this area. This new project will consist of some 85 miles of canals, six reservoirs and up to 240 miles of pipeline. These works will transport water from the South Saskatchewan Reservoir to supply all major users in a broad area presently short of water. Irrigation, recreation, wildlife and municipal water needs can be supplied along with the major requirements of the potash industry with relatively modest additional cost.

Amendments to the Water Resources Commission Act were approved by the Saskatchewan Legislature at its 1966 session to permit the establishment of the Saskatchewan Water Supply Board. This new agency will be responsible for the construction, operation and maintenance of approved multi-purpose projects. The establishment of this new agency goes a long way to complete the framework of provincial agencies required for orderly water resource planning and development.

Canadian waters have recently become a matter of public debate. Those in favour of the export of this resource base their argument on the fact that Canada has vast quantities of fresh water and that Canada should sell this surplus to meet needs in areas of shortage. It is the view of the Government of Saskatchewan that water is a fundamental resource and that history has amply demonstrated that the prosperity of every human society depends on an abundant supply of usable water available at reasonable cost. While we do not deny that there are practical reasons

why joint development and sharing of water in international streams can be beneficial to both countries, we strongly believe that national waters are entirely Canadian and that our country has no obligation to make this resource available for use outside Canada. This should not exclude, of course, any reasonable schemes to assist our neighbours and ourselves where there are advantages to Saskatchewan and Canada and where our essential interests are not damaged.

Saskatchewan must insist that sale of this vital resource not be considered until a detailed inventory of the resource and of our future requirements have been completed by Canadian investigators. The Government of Canada should take the initiative in developing a unified, national water policy. This policy should be drafted after appropriate consultation with provincial and regional authorities, but there is an urgent need for long-term planning for future water needs in all parts of Canada, without regard to provincial or other local boundaries. Saskatchewan is pleased with the decision of the Government of Canada to participate in a joint study of the water resources of the Saskatchewan-Nelson Basin and strongly urges an early start on this study. This Government is prepared to assist in any way possible in the development of a national water policy.

Saskatchewan faces the expenditure of millions of dollars in water development projects to meet the growing needs of our expanding economy. The Government is prepared to make this money available but insists that this development capital be channelled in such a way that the maximum benefit consistent with servicing all potential groups of users is achieved. We are confident that the most beneficial allocation, development and use is possible within the framework of the present planning and development agencies of the Provincial Government.

Respectfully submitted,  
W. Ross THATCHER,  
*President of the Executive Council.*

# SASKATCHEWAN WATER RESOURCES COMMISSION

REGINA, SASKATCHEWAN,  
April 1, 1966.

HONOURABLE W. ROSS THATCHER,  
President of the Executive Council.

SIR:

We have the honour to present the Annual Report of the Saskatchewan Water Resources Commission for the fiscal year ending March 31, 1966.

The Water Resources Commission Act was proclaimed on December 1, 1964, and last year's report covered a four-month period of activity. The following report, therefore, summarizes the Commission's activities for its first full year of operation.

During the year under review, the Commission was able to test in practice the procedures which it developed to discharge the responsibilities assigned to it under the Water Resources Commission Act. The Commission is essentially an advisory, consultative, investigatory and planning agency. The success of its program depends in large part on its ability to marshal the technical and professional resources of all provincial government agencies to develop plans for the most efficient use of this province's water resources. The full co-operation of these other agencies is essential to achieve these program goals. We are happy to report that this was the case. Other government agencies willingly made staff available to assist the Commission in these studies.

The Commission is particularly pleased to report the efficient and expeditious manner with which its first feasibility evaluation of a proposal for a multi-purpose development was carried out. Alternative methods of supplying the water needs of all major users in the Saskatoon-Southeast area were analyzed and a development proposal recommended to your Government in seven months. The Government decision to proceed with this project in accordance with these recommendations means that water will be made available in a water-short area to meet foreseeable future needs. The development potential of the area has been increased accordingly.

The Saskatchewan Water Supply Board was created to build and operate this and other multi-purpose water supply projects should ensure rapid implementation of decisions to proceed with projects. This era of growing industrialization and increasing population concentration in Saskatchewan can only be sustained if the basic resource — water — can be provided at the place and at the time it is needed. It is the Commission's hope that the formation of this new action agency will assist in the achievement of this goal.

The Commission continued its program of administration of water allocations under the regulations of The Water Rights Act, The Ground Water Conservation Act and The Water Power Act. New regulations under The Ground Water Conservation Act were being drafted at year end. These new regulations were intended to simplify the procedures involved in securing the right to use ground water and to provide for more accurate assessment of actual ground water use.

During the year under review, Messrs. J. W. MacNeill, Vice-Chairman and Executive Director; and J. W. Churchman, Member, resigned to take positions with the Government of Canada. The Commission acknowledges the valuable contribution of Mr. MacNeill in the formation of this agency and his direction of the staff during this initial period of operation. Mr. Churchman served as a member in his capacity as Deputy Minister of Natural Resources and his assistance in co-ordinating the work of these two agencies was substantial indeed.

The Commission was extremely fortunate in securing able replacements for these two members. Dr. C. D. Stewart was appointed Vice-Chairman and Executive Director. Dr. Stewart's broad experience in government, private business and university work will be valuable in his new work as chief administrative officer of the Commission staff. Mr. W. R. Parks, Deputy Minister of Natural Resources, was appointed as a member. We are certain that Mr. Parks will ably represent the department in Commission deliberations.

Recruitment of permanent staff for the Commission continued and by the end of the fiscal year, 37 of the 41 approved permanent positions had been filled. The Commission would again like to acknowledge the efforts of the staff in carrying out a large work program.

In summary, the Commission believes that 1965-66 provided a real test of the overall approach to water resource management envisaged when this agency was formed. We believe the evidence reveals that the approach is basically the correct one. In the forthcoming year, more time will be available for long-range planning for regional development of this resource.

Respectfully submitted,

H. W. POPE, *Chairman*  
C. D. STEWART, *Vice-Chairman*  
J. G. CLARKSON, *Member*  
D. B. FURLONG, *Member*  
W. H. HORNER, *Member*  
W. R. PARKS, *Member*  
J. J. MOORE, *Member*

# THE PROGRESS OF THE COMMISSION

## Chapter I

The powers and responsibilities of the Saskatchewan Water Resources Commission were outlined in some detail in the preceding annual report. The Water Resources Commission Act provides the Commission with an overall advisory, consultative, co-ordinative and planning function relating to our water resources. The Act instructs the Commission to advise the Government on the conservation, development, management and use of water and associated resources of the province, to consult with and advise provincial departments and agencies and to undertake and co-ordinate investigations on these matters and supervise all problems relating to water pollution.

At the time of last year's report, the Commission had been in operation for a period of four months. This report covers the first full year of operation of this new agency. Some difficulty was experienced in recruiting the technical and professional staff required to discharge its responsibilities, but good progress was made during 1965-66.

The on-going program of the Commission in the areas of project co-ordination on the South Saskatchewan River Project and of regulation of water use under the provisions of The Water Rights Act, The Ground Water Conservation Act, and The Water Power Act were continued. The first stage of the South Saskatchewan River Project, namely, the construction of the main reservoir works, was well advanced at year end. The plans of the various provincial agencies for reservoir operation and irrigation, power, and recreation development were proceeding according to schedule as well. The vital preliminary work on development of the benefit phases of the project should ensure early realization of the potential benefits of this magnificent new reservoir in the heart of west-central Saskatchewan.

In the area of investigation and planning, the Commission adopted the concept of basin or regional studies of future water requirements. The Commission recognized that studies of individual water requirements of industries and urban communities on an ad hoc basis may lead to relatively inefficient and costly developments. Where long-range development plans on a regional or basin basis have been prepared, individual developments can be proceeded with in conformity to long-range needs and often other water requirements can be served at little extra cost in a multi-purpose supply system.

The Commission recognized that its resources were too limited to permit concurrent study of all areas of the province. In developing priorities for studies, the Commission is concentrating on areas facing actual or impending water shortages that may limit development. At the same time, continuous process of data collection regarding the water supply situation in the whole province is being carried on in conjunction with the Water Resources Branch, Department of Energy, Mines and Resources, Government of Canada. A start has been made on an overall assessment of the future demands for water to the year 2000.

Early in 1965, the Commission became aware that consideration was being given to single purpose pipelines from the South Saskatchewan River to serve the needs of potash mines under construction in a broad area south and east of Saskatoon. Large increases in population of nearby urban communities were forecast as a result of this potash development. Many of these centres were experiencing difficulty in supplying the water needs of their existing populations. Earlier studies also identified several blocks of irrigable lands. As a first step in

determining the water needs of the area, the Commission held public hearings to determine local interest. The hearings were very well attended and considerable support was evident for a multi-purpose supply system.

The Commission established a study team to investigate the feasibility of supplying a wide range of water needs by a multi-purpose project. The technical resources of other government agencies and private consultants were utilized. The aspects studied were ground water sources, demineralization of ground water, alternative system designs for surface supply, water quality, the recreation potential, irrigation feasibility, a benefit-cost comparison, financial feasibility, and administrative arrangements for project construction and operation.

The study process was interesting from two standpoints. First, it represented the first major attempt by provincial agencies to complete an economic and physical feasibility study of a multi-purpose development proposal. Second, it served as a severe test of the Commission's basic approach in investigation of water development alternatives. The excellent co-operation received from other agencies and the dedication of the Commission's own staff enabled these investigations to be completed and a recommendation forwarded to the Government within a period of seven months from the initiation of the study.

With the Government's decision to proceed with the project, consideration was given to the type of organization to construct and operate the supply works. This activity could be undertaken by one of the user agencies, the Commission, or a new agency. The first possibility was ruled out because it was felt that it would be undesirable for an agency with prime responsibility for development of a particular phase of water use to operate a project involving supply to various kinds of users. Since the Commission is structured essentially as an advisory, investigatory and co-ordinating agency, it was felt that the addition of construction and operating responsibilities would detract from its ability to discharge these responsibilities. A decision was made to establish a new public utility to build and operate this multi-purpose water supply project and other similar projects. This agency was established by Order-in-Council under the provisions of The Crown Corporations Act on a temporary basis. At year end, an amendment to the Commission Act created the Saskatchewan Water Supply Board.

Following the public hearings on the Moose Jaw Creek and the Saskatoon-West areas, the Commission proceeded with plans for a comprehensive water requirement study and of alternative means of meeting these requirements.

A detailed inventory of policies and programs of other provincial governments in the pollution control field was completed during the year. This survey was supplemented by an assessment of the extent of the pollution problem and of the control measures currently in force in Saskatchewan. At year end a draft policy statement was being prepared by a committee consisting of officers of the Department of Natural Resources, Department of Public Health and the Commission. During the coming year, the Commission plans to recommend pollution control regulations for Government consideration.



# ADMINISTRATION BRANCH

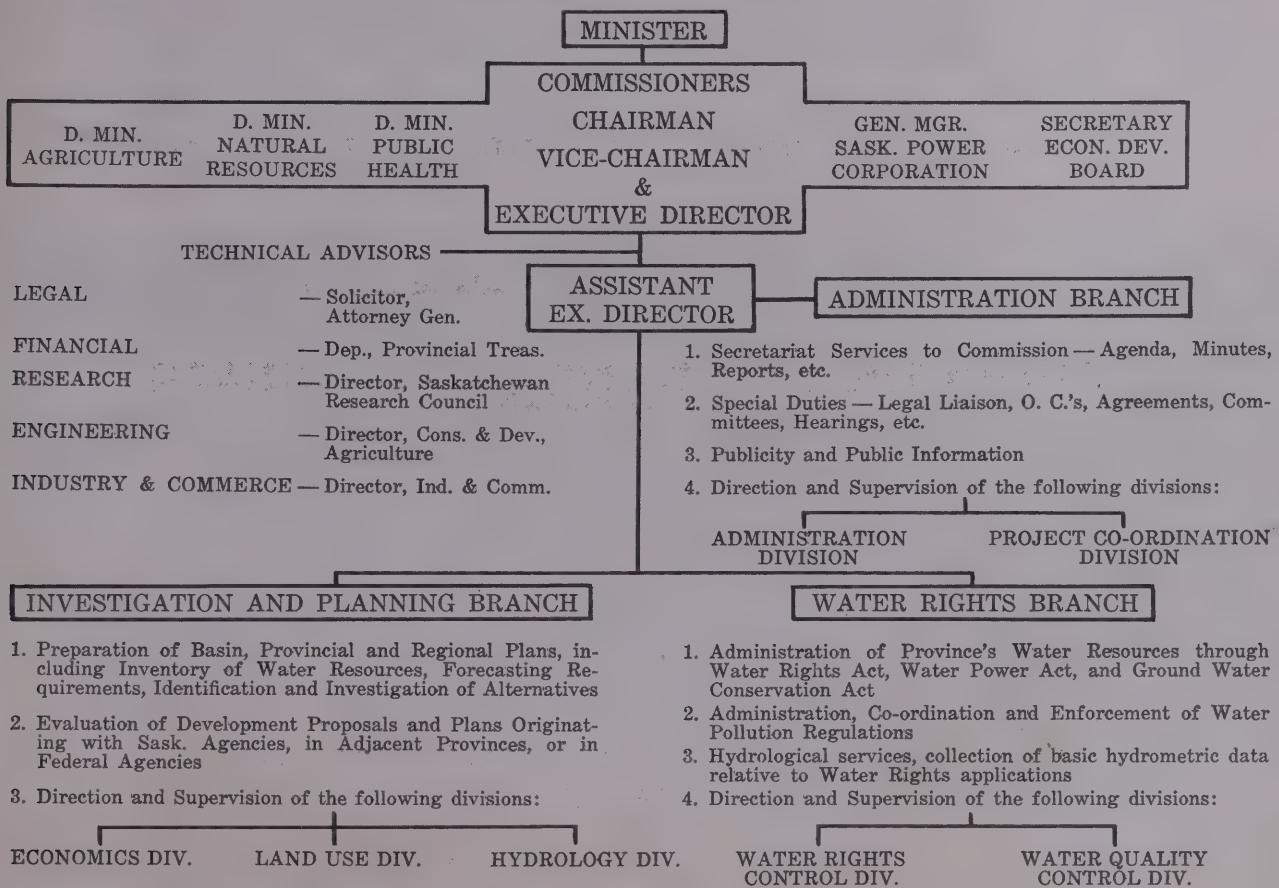
## Chapter II

The Administration Branch is responsible for secretariat services to the Commission, general administrative services, project co-ordination on designated multi-purpose projects, public information services and special duties, such as legal liaison and project agreements.

The Commission held 10 regular meetings during the year. At these meetings, the Commission reviewed the progress of work undertaken by its own staff as well as review and recommendations for action regarding proposals of other agencies in the water development field. In addition, the Commission held three public hearings to determine local views on water requirements of three areas of the province. A public hearing was held in May, 1965, at Humboldt, for the Saskatoon-Southeast area; in June, 1965, at Moose Jaw, for the Moose Jaw Creek Drainage Basin; and in February, 1966, at Saskatoon, for the Saskatoon-West area. The Administration Branch services include preparation and circulation of agenda, background reports, and minutes of regular meetings and the organization for and preparation of official proceedings at these public hearings.

### SASKATCHEWAN WATER RESOURCES COMMISSION

#### FUNCTION CHART



The Administrative Services Division of the Branch provides centralized services of budgeting, accounting, personnel administration, procurement and property control for the Commission. A pooling arrangement has been adopted to provide stenographic services for the entire Commission staff and a central filing and library system has been implemented.

The Water Resources Commission provides consultation and advice to participating provincial agencies on program planning and scheduling of the planning and development of designated projects. This responsibility is discharged by the Administration Branch. On projects involving federal participation, the Assistant Executive Director serves in a liaison capacity between agencies of the federal and provincial governments.

The South Saskatchewan Project has been previously formally designated and referred to the Commission. During the year, the Administration Branch prepared a report on scheduling and budgeting of provincial aspects of the development for the guidance of the Treasury Board. Regular statements of provincial expenditures on shareable cost items under the terms of the project agreements were prepared and forwarded to the federal authorities. Similarly, the annual provincial claim statements regarding these expenditures for the previous fiscal year were prepared from information provided by the action agencies. Continuous liaison services were provided to achieve co-ordination.

Late in the year, Cabinet designated and referred the Saskatoon-Southeast Project to the Commission. This multi-purpose project will involve the Branch in the co-ordination of the development programs of two government departments, the Saskatchewan Water Supply Board and non-government agencies.

This Branch has the responsibility for preparation of the various public reports of the Commission. Interested individuals and groups are supplied with information on Saskatchewan water resources through arrangements for speakers, press releases, magazine and newspaper articles, photographs, exhibits and the answering of inquiries.

At year end, the Branch had an approved complement of 10 permanent and two temporary staff.

# INVESTIGATION AND PLANNING BRANCH

## Chapter III

"The Commission may make or cause to be made such research, investigations, surveys or studies relating to the planning, development and use of the water and associated resources of Saskatchewan as it deems necessary or desirable. . . ." So the Water Resources Commission Act sets the stage for the work of the Investigation and Planning Branch. Specific reference is made to investigations to establish the existing surface and ground water resources in a basin, to determine requirements for water for all uses and to establish means and prepare plans for the conservation, development, augmentation and use of such resources.

The Commission is responsible for the co-ordination of planning and development of specific multi-purpose projects such as the South Saskatchewan River Project and this Branch is responsible for the development of plans for reservoir operation and land use control. Branch activities are centered in three divisions, an Hydrology Division, an Economics Division and a Land Use Division. The major work of each Division for the current year is summarized in the following paragraphs and illustrated in charts throughout the report.

Chart 1 — Investigation and Planning Branch Functions.

Chart 2 — Probable Pattern of South Saskatchewan Reservoir Operation—Average Year.

Chart 3 — Schematic Map of Qu'Appelle Valley.

Chart 4 — Last Mountain Lake Levels—Showing Probable Effect of Diversions of South Saskatchewan Water.

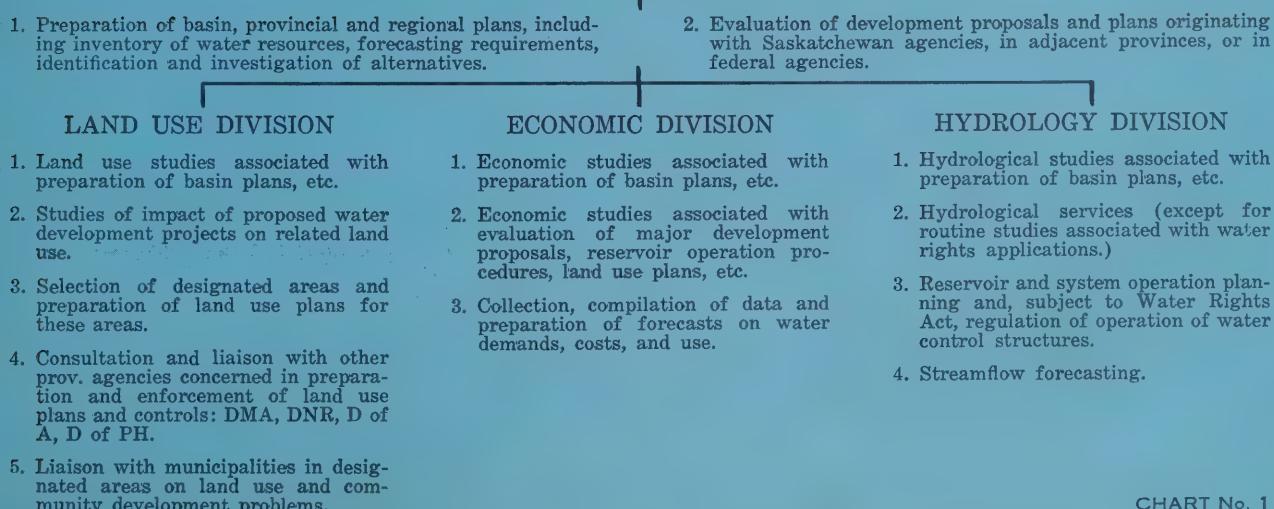
Chart 5 — Buffalo Pound Lake Levels—Showing Probable Effect of Diversions of South Saskatchewan Water.

Chart 6 — Basic Data Transmittal Arrangements for Forecasting Service.

Chart 7 — Sediment Ranges.

### FUNCTION CHART

#### INVESTIGATION AND PLANNING BRANCH



## HYDROLOGY DIVISION

The Hydrology Division is responsible for hydrologic and hydraulic studies associated with the development of reservoir and system operation plans and procedures and the preparation of integrated and co-ordinated plans to guide in the development and use of the water and associated resources within the river basins of Saskatchewan. It is also responsible for hydrologic investigations, research and studies to develop criteria for the design and operation of projects and works, including the provision of streamflow forecasting services.

To carry out the work of the Division in the above areas, its staff is sub-divided into a Reservoir Planning Section and a Basin Planning Section. The major studies that were dealt with by each Section in the current year are described below.

### RESERVOIR PLANNING SECTION

#### *Development of South Saskatchewan Reservoir Operation Procedures —*

The main reservoir works are scheduled to be completed by fall of 1966, and a start on filling of the reservoir will be made after July of 1966. The immediate plans are to store enough water for release to ensure that the reservoir will be filled to minimum operating level by July of 1967 for the purpose of delivering water to the Saskatoon-Southeast Project via the irrigation pumping plant. It is also anticipated that some water will be released to the Qu'Appelle in 1967 and additional releases to Squaw Rapids will be made during the winter of 1967-68. During 1968 the first units at the Coteau Power Plant will be placed in operation and initial irrigation on the South Saskatchewan Project will begin.

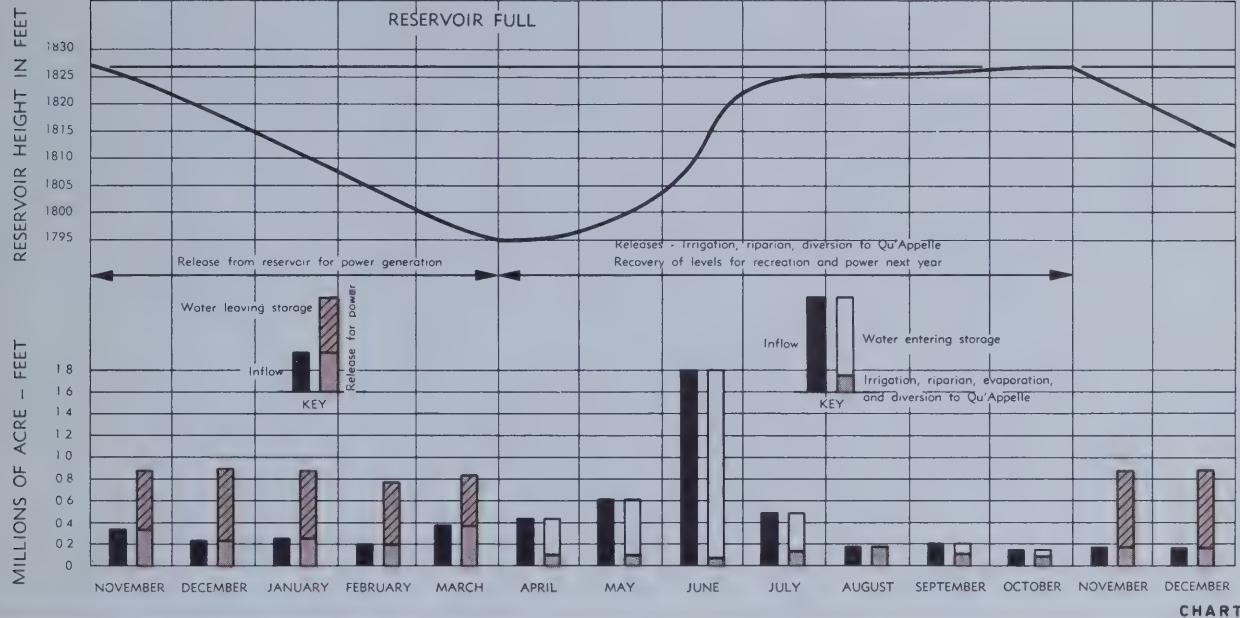
A major objective of operation planning studies to date has been to develop reservoir operation procedures that will provide maximum overall benefits from the reservoir for irrigation, power, recreation, municipal and industrial water supply, and flood control while at the same time making adequate provision for minimum flow requirements downstream for dilution, riparian rights, and ferry operation. This task is complicated by the fact that operation of the reservoir to yield the greatest benefit for one of these purposes may be in conflict with the pattern of operation required to secure maximum benefits for other purposes.

With the above considerations in mind, several hydrologic studies have been carried out to test various patterns of operation based on recorded river flows. This work has required supplemental studies to develop logical operating assumptions for related projects both downstream and upstream in Alberta. In an average year water will be released from reservoir storage for power generation during winter when the demand for power is high and the natural runoff in the Saskatchewan River System is low. During the spring and summer when most of the runoff occurs, flows will be stored in the reservoir to provide maximum flood control benefit and to recover levels for recreation use during summer months and for power generation the following winter. At the same time releases will be made to maintain a minimum flow in the river downstream, to meet irrigation requirements and to meet a variety of needs in the Qu'Appelle Basin.

#### *Development of a Master Plan —*

The province must be prepared to take over and operate the reservoir and to integrate that operation with other structures and works in the Saskatchewan and

# PROBABLE PATTERN OF RESERVOIR OPERATION - AVERAGE YEAR

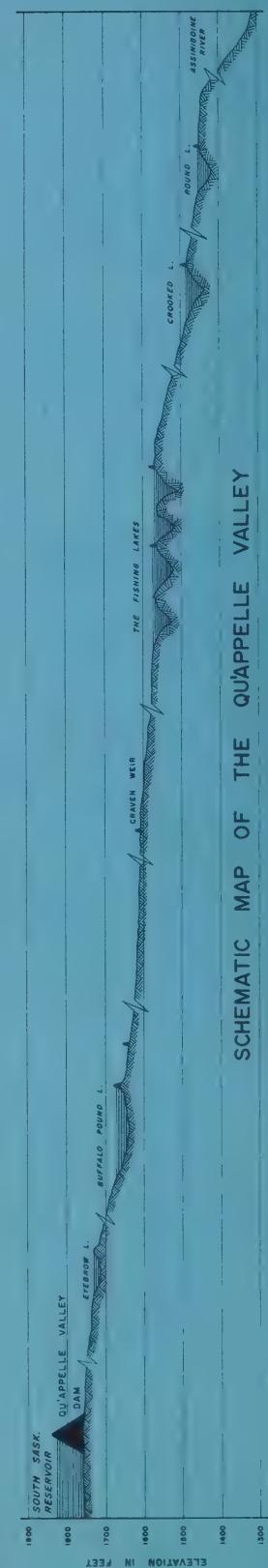


Qu'Appelle Systems no later than early 1967. A comprehensive master plan must be developed and implemented before that date that will detail every aspect of administration and operation of these systems with efficiency.

The development of a master plan is a complex and difficult task. It must provide for the integration and co-ordination of the operation of two reservoirs and two power plants on the Saskatchewan, eight reservoirs in the Qu'Appelle and numerous control structures and works. It must provide for the operation of several major municipal and industrial water supply and sewage disposal systems, and the operation of irrigation schemes at the South Saskatchewan Project and in the Qu'Appelle. It must also consider the development and operation of six provincial parks, a host of private and institutional recreation facilities, and an extensive network of transportation facilities for railway, highway, municipal road, and ferry crossings.

In addition to the physical operation component, the plan must detail arrangements for system operation planning. This aspect involves the setting up of interagency co-ordination committees and work groups, and for the development of operation plans and schedules. Provision must also be made for the dispatching and execution of week-to-week and day-to-day operation instructions. This in turn involves the development of comprehensive forecasting, basic data collection, and communication systems. To complicate matters integrated operation will involve, in varying degrees, at least nine provincial and three federal agencies, three major cities, some one dozen towns and villages, a number of industrial firms, and the general public. Finally, the master plan should present an arrangement for handling maintenance of all structures and works that will be involved.

Work proceeded during the current year with the objective that the comprehensive master plan must be available by the end of the 1966-1967 fiscal year.



## SCHEMATIC MAP OF THE QU'APPELLE VALLEY

### *Qu'Appelle Operation Planning —*

One of the prime benefits of the South Saskatchewan Reservoir will be diversion of water to the Qu'Appelle. This will be achieved and controlled by means of a conduit and gates provided in the Qu'Appelle Valley Dam. Assuming completion of the reservoir in the fall of 1966, it is anticipated that minimum operating level and diversion to the Qu'Appelle may take place about mid-summer of 1967.

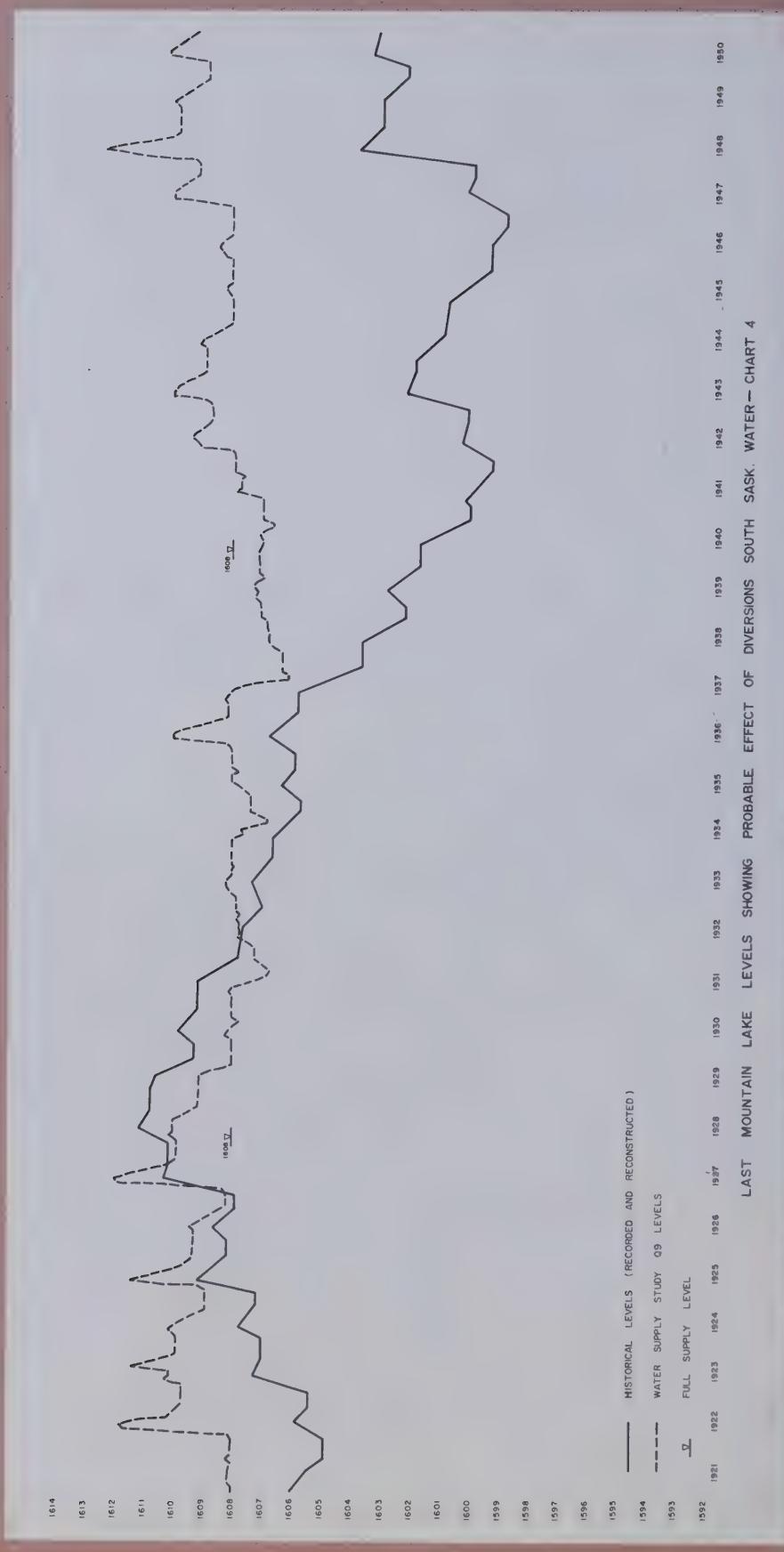
The benefits to be derived from Qu'Appelle diversion are many. These include: the benefit to recreation at the eight heavily developed lakes in the Qu'Appelle Valley as a result of maintained levels in years of natural runoff shortages; the benefit to the cities of Regina and Moose Jaw as a result of an assured supply of good quality water in Buffalo Pound Lake; and the benefits in terms of adequate water supplies for municipal, irrigation and industrial use, and pollution abatement both in the Qu'Appelle and in other parts of southern and eastern Saskatchewan which may be serviced via the Qu'Appelle. There can be no doubt that the diversion of South Saskatchewan water will make the Qu'Appelle Valley a vital link in a water distribution system which will be of major importance to the economy of this part of the province.

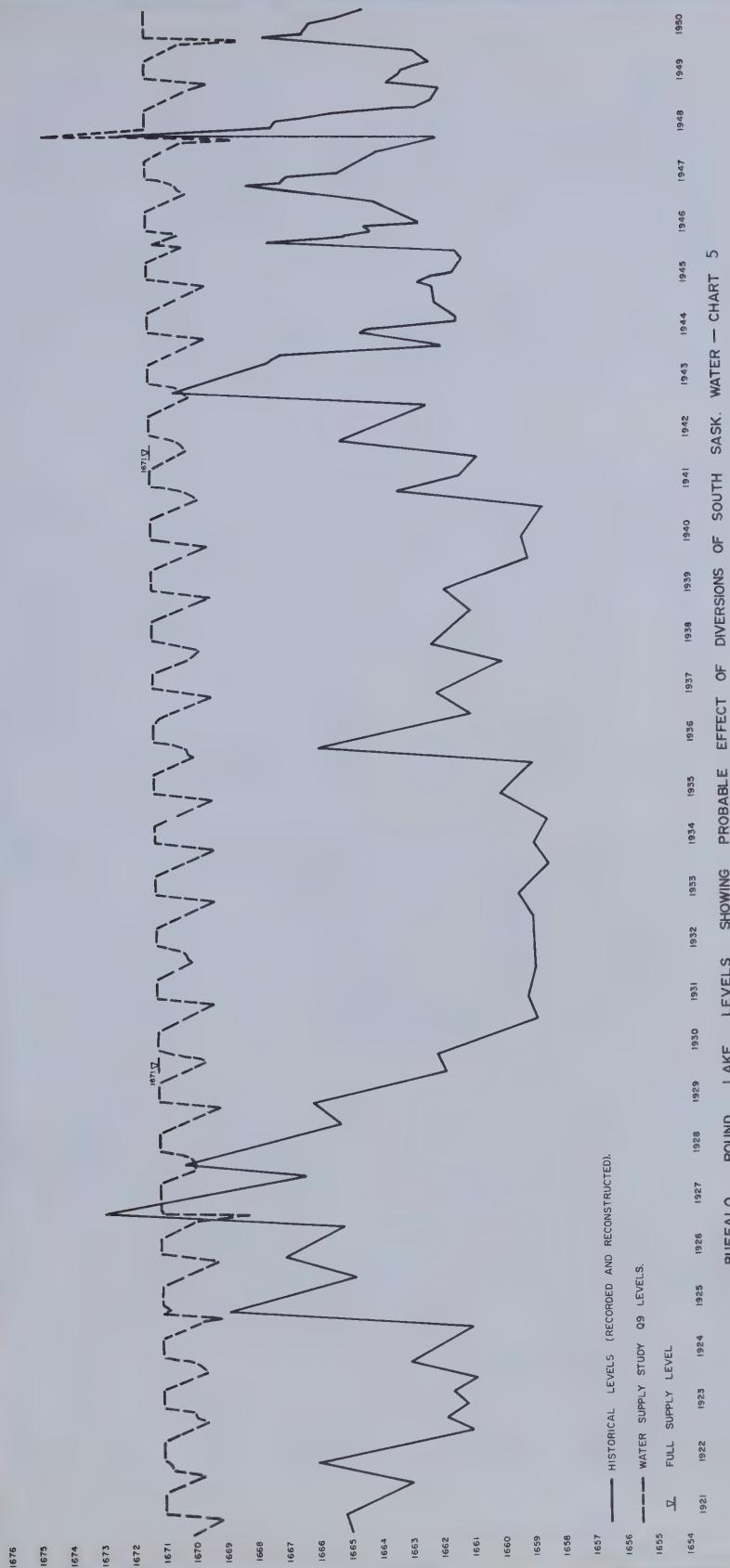
At the same time it must be realized that the question of diversion has presented many difficult problems. One of the early tasks faced was to recommend the size of outlet works in the Qu'Appelle Valley Dam. This was achieved by forecasting the present and future requirements for South Saskatchewan water to supplement the irregular flows in the Qu'Appelle River and undertaking numerous hydrology studies for operation of the Qu'Appelle System of reservoirs and works.

The outlet works installed in the Qu'Appelle Dam will enable large diversions into the Qu'Appelle but these diversions can involve lost benefits on the Saskatchewan System. Less water will be available to generate energy at the Coteau Creek and Squaw Rapids power stations, there may be a slight adverse effect on the level of the South Saskatchewan Reservoir affecting recreation use and there would be a corresponding increase in irrigation pumping costs. Another problem arises in the Qu'Appelle because the present channel capacity is limited in certain areas and substantial improvements will be required in order to pass the large flows in the future.

Studies of this channel improvement problem have been under way for several years by the Conservation and Development Branch of the Department of Agriculture and the Hydrology Division. In addition, to provide background information for channel improvement work that will be undertaken in the reach from the dam to Buffalo Pound Lake during 1966 and 1967, the 1966 spring runoff was carefully observed in the field. Further field and office studies will be required in the next few years in preparation for the work required in the reach from Buffalo Pound to Pasqua Lake.

These physical problems, however, will be overshadowed by the complex problems of efficiently integrating the operation, not only of the Qu'Appelle and Saskatchewan Systems, but of the many structures and works on the Qu'Appelle itself. One of the most difficult operation problems will be how to improve and maintain the lake levels for water-based recreation while at the same time minimizing the problems that will result in times of flood. This situation arises because the seriousness of a flood in the Qu'Appelle depends in large part on the level of the lakes at the time that the flood occurs. This is especially true in the case of Last Mountain Lake and to a lesser extent, Buffalo Pound, since both lakes have acted as surge tanks in times of flood, receiving large quantities of water from the main stem of the Qu'Appelle River and thereby reducing flood flows downstream.





## LEGEND



### METEOROLOGICAL STATIONS

Synoptic—  
REPORT TWICE DAILY MAR. 1—OCT. 31

Precipitation Summary Stations—  
REPORT MONTHLY NOV.-APR.,  
WEEKLY MAY-OCT.

### HYDROMETRIC STATION LOCATION

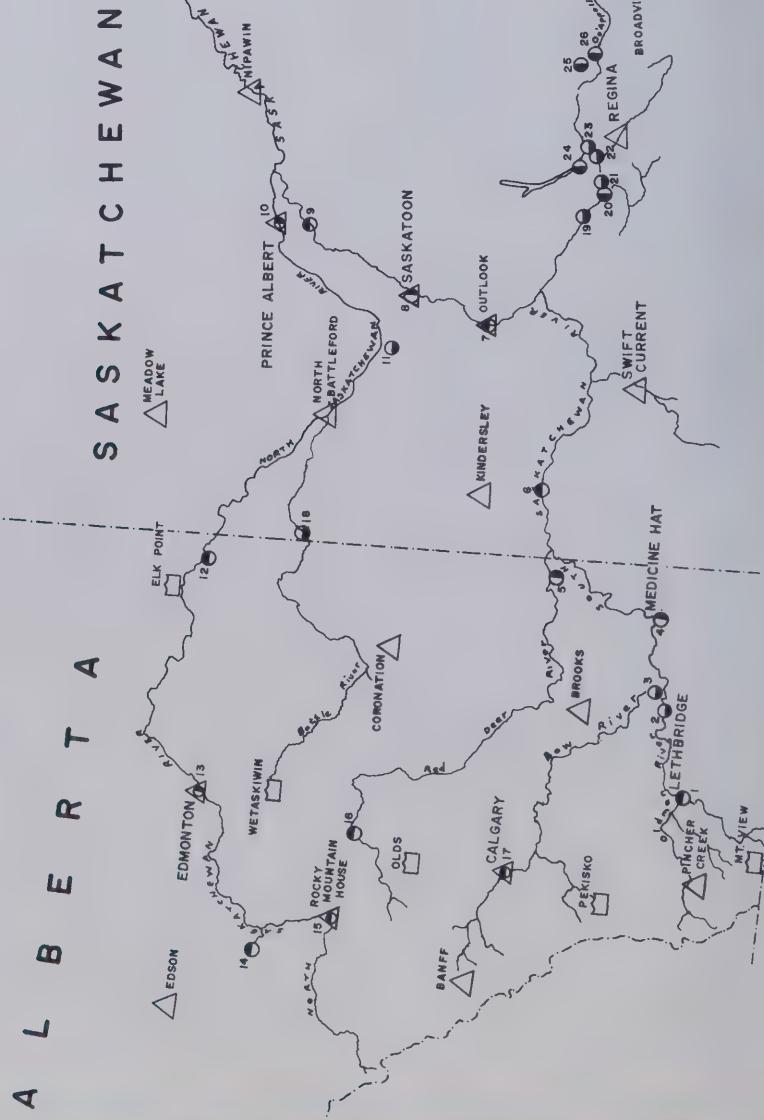
DAILY YEAR ROUND REPORTS BY TELEPHONE  
DAILY, TELEPHONE, ABOUT 3 MONTHS,  
9 MONTHS DAILY POSTCARD  
DAILY, TELEPHONE, ABOUT 1 MONTH, DAILY  
POSTCARD REST OF OPEN WATER SEASON  
DAILY, TELEPHONE, ABOUT 1 MONTH, POSTCARD  
2 PER WEEK REST OF OPEN WATER SEASON

### HYDROMETRIC STATION LOCATION

- 1 OLDMAN R. AT LETHBRIDGE
- 2 OLDMAN R. ABOVE GRAND FORKS
- 3 BOW R. ABOVE GRAND FORKS
- 4 SOUTH SASK. R. AT MEDICINE HAT
- 5 RED DEER R. NEAR BINDLOSS
- 6 SOUTH SASK. R. AT LEMSFORD FERRY
- 7 SOUTH SASK. R. AT OUTLOOK
- 8 SOUTH SASK. R. AT SASKATOON
- 9 SOUTH SASK. R. AT ST. LOUIS
- 10 NORTH SASK. R. AT PRINCE ALBERT
- 11 EAGLEHILL CREEK NEAR ROSETOWN
- 12 NORTH SASK. R. AT LEA PARK
- 13 NORTH SASK. R. AT EDMONTON
- 14 BRAZEAU R. BELOW BIG BEND
- 15 NORTH SASK. R. AT ROCKY MOUNTAIN HOUSE
- 16 RED DEER R. RED DEER
- 17 BOW R. AT CALGARY
- 18 BATTLE R. AT UNWIN
- 19 QU'APPELLE R. ABOVE BUFFALO POUND LAKE
- 20 BUFFALO POUND LAKE
- 21 QU'APPELLE R. BELOW BUFFALO POUND LAKE
- 22 QU'APPELLE R. AT LUMSDEN
- 23 QU'APPELLE R. BELOW CRAVEN DAM
- 24 LAST MOUNTAIN LAKE
- 25 ECHO LAKE
- 26 KATEWA LAKE
- 27 CROOKED LAKE
- 28 ROUND LAKE

### BASIC DATA TRANSMITTAL ARRANGEMENTS

FOR FORECASTING SERVICE  
CHART - 6



In view of these considerations, continuing operation studies of the Qu'Appelle System are required to develop, refine and update operating procedures.

Actual releases to the Qu'Appelle will be undertaken on a staged basis. That is to say, full scale diversion to the Qu'Appelle will not likely be obtained for a period of several years. During 1967, it is expected that water will be released to meet the needs of Buffalo Pound Lake; the following year, 1968, water may be released to Last Mountain Lake as well. Releases to downstream lakes may not occur before 1969. This schedule will depend in large part on the natural runoff situation over the next few years and the magnitude and nature of demands for water at various points on this river and lake system.

*Saskatchewan's Streamflow Forecasting Service —*

Streamflow forecasting has become an integral part of water resources planning, development and project operation. Experience elsewhere and our own studies have shown that substantial benefits will accrue from the application of forecasting to the Saskatchewan-Qu'Appelle operation. These benefits involve greater power production and better irrigation scheduling and flood control and enhanced recreation values. Additional benefit will result from the application of the forecasting techniques developed to other streams, reservoirs and water development projects in Saskatchewan.

These advantages and needs were recognized in the setting up of the Commission and provision was made for it to provide streamflow forecasting services for Saskatchewan government agencies and the public. This task has been assigned to the Hydrology Division.

Streamflow forecasts are required now for the operation of Squaw Rapids Power Plant. When the South Saskatchewan Reservoir begins operation in 1967 regular forecasts will be a basic tool in developing annual and monthly operation plans, and in week-to-week and day-to-day scheduling of releases so that the best utilization of runoff and storage will be obtained in an integrated Saskatchewan-Qu'Appelle System. In view of these needs, and realizing that some time will be required to get such a service functioning smoothly and effectively, steps were taken during the past several years that made it possible to officially inaugurate Saskatchewan's forecasting service on March 1, 1966.

These steps have included: studies to develop forecasting techniques and relationships for the Saskatchewan and Qu'Appelle Basins using historical streamflow and meteorological data; studies to assess and improve upon the existing gauging network for the collection of basic data; and studies to develop a comprehensive plan for a forecasting service. The latter has involved, among other things, meetings and seminars with officials of interested agencies to exchange information and to obtain a co-ordinated approach. It also involved discussions and negotiations with the federal Water Resources and Meteorological Branches respecting arrangements for the collection and transmission of basic data to the Commission's "Forecasting Centre" by telex, telephone and post card.

The full impact of the operation of this forecasting service in terms of staff and work requirements will only be apparent after several years of operation. However, it will involve the daily processing, analyzing, recording and filing of the basic data that is received; the translation of the basic data into terms of forecasted river flows and water volumes; the dispatch of forecasts to interested

agencies; and perhaps the interpretation and application of these forecasts. When the period of actual operation of the South Saskatchewan and related reservoirs is reached, it is anticipated that an additional major task associated with this service will be the application of these forecasts to the development of monthly, weekly, daily and perhaps hourly operation procedures and release schedules.

Studies in all of the areas discussed above proceeded during the current year. In addition, forecasts were developed to meet the special requirements of the Conservation and Development Branch regarding water levels on Cumberland Lake near The Pas and at works under construction near Leader. Studies were continued for the development of new and additional forecasts within the Saskatchewan and Qu'Appelle Basins.

*Reservoir Release Studies —*

Reservoir operation procedures will be influenced by the effect of storage and water releases downstream of the dam. Minimum flow requirements, time of water travel, and the effect of variable water releases on ice cover are some of the factors for which more information is required. In order to gauge the effect of variable release patterns at downstream points, a provincial committee was established to plan and undertake release tests with the co-operation of the PFRA. The committee is comprised of representatives of the Commission, the Department of Agriculture, Saskatchewan Power Corporation, and the Department of Public Health and is chaired by the Head of the Hydrology Division. Under the direction of the Release Committee, a series of release tests were undertaken in the fall of 1964. Unfortunately, conflicts with the construction schedule, unforeseen construction problems and high flows in the river have made it impossible to undertake further tests since that time.

Progress was made on the analysis of the data collected in the 1964 tests and the preparation of a report thereon. The Division also directed and co-ordinated the hydrometric program between the dam and The Forks associated with this program and participated with the Water Rights Branch in the field work involved. In addition, plans were prepared for future release studies.

Future release studies will be separated into two closely related projects that have been designated by the National Committee of the International Hydrologic Decade, as two of four projects sponsored by the Saskatchewan Government. The first, labelled IHD Project No. 20, is entitled "A Study of Unsteady Flow in a Shallow River Channel", and the second, IHD Project No. 21, is entitled "The Effect of Variable Releases from a Large Reservoir in Winter on Ice Formation, Breaking and Jamming". The Head of the Hydrology Division has been named Project Co-ordinator of these Decade projects.

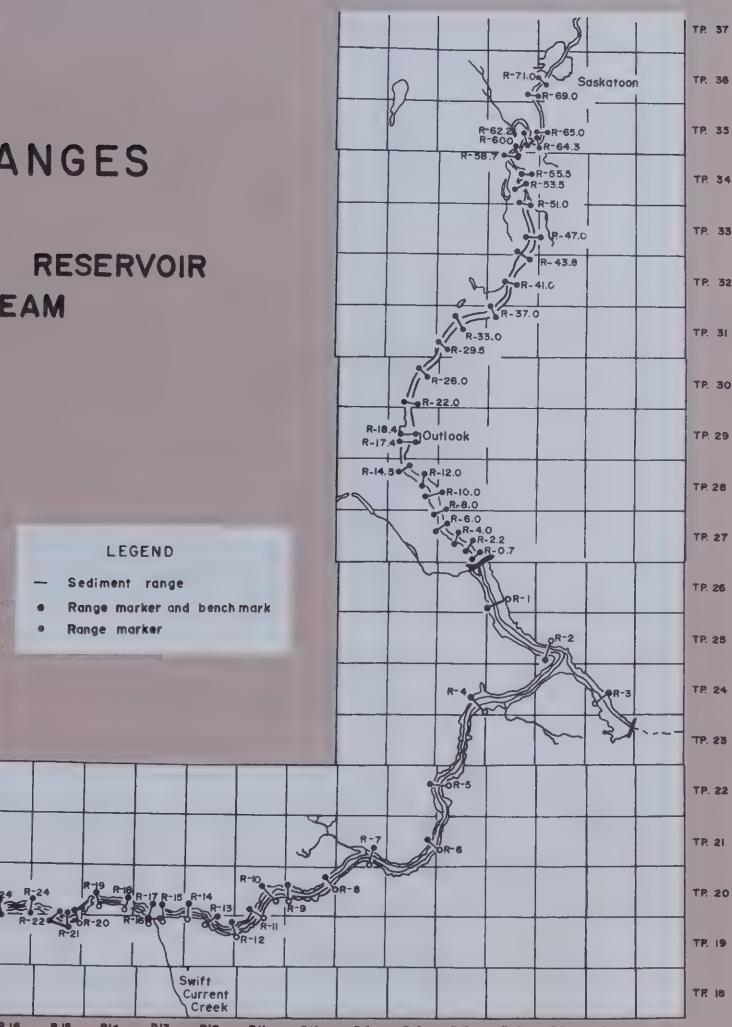
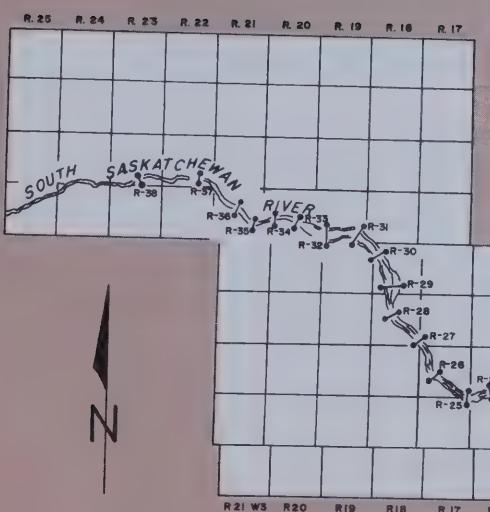
*Sediment Range Programs —*

The South Saskatchewan River carries a substantial load of sediment. Most of this sediment will be deposited in the reservoir. Although the amount of sediment will not affect the useful storage of the reservoir, it is expected to deposit in the form of a delta extending a considerable distance into the reservoir and for a number of miles upstream. This in turn may affect shoreline planning and development, the design and maintenance of structures, and the efficient operation of the reservoir. As a result of this deposition, relatively clear water will be released from the reservoir. The clear water will scour and change the condition of the river channel for some distance downstream.

In order to learn more about this process, programs were set up to systematically chart the progress of sedimentation in the reservoir and changes in river conditions downstream from the dam. Late in 1964 these programs were also designated as International Hydrologic Decade projects under the direction of the Hydrology Division. Project No. 16, "A Study of Aggradation and Degradation Below a Large Reservoir" deals with the reach of the river between the dam and Saskatoon, while Project No. 17 is confined to the reservoir area as indicated by its title, "Delta Formation and Sedimentation in and Upstream from the South Saskatchewan Reservoir".

## SEDIMENT RANGES

# SOUTH SASKATCHEWAN RESERVOIR AND DOWNSTREAM



To observe downstream changes in river conditions (Project No. 16), 28 cross-sections (ranges) were established between the dam and Saskatoon. Bench marks on both sides of these ranges were established by the Department of Natural Resources, Surveys Branch, while observations were taken by the federal Water Resources Branch.

Project No. 17 will involve the installation and levelling of bench marks and markers for 38 ranges upstream of the dam. A start was made on this work during 1965 by the Department of Natural Resources crews under the direction of the Division. A considerable portion of this basic work remains to be done in 1966.

A start on the sounding and profiling of these ranges was made in 1965 by the federal Water Resources Branch but the bulk of this work also remains to be done in 1966. As in the case of Project No. 16, the Hydrology Division's work, which will continue annually for several years, involves liaison and co-ordination, processing and analysis of field data.

There is a need to extend Project No. 17 to include a study of water surface profiles at the upper end of the reservoir to determine changes in the water surface with time for comparison with natural conditions. Plans were developed to include this work in the 1966 program.

#### *Evaporation Program —*

Evaporation losses will significantly affect the operation of the South Saskatchewan Reservoir, the Qu'Appelle Lakes and many other lakes and reservoirs in the province. Because of the lack of adequate data and empirical formulae for determining these losses on the Prairies, an evaporation measurement program, in co-operation with the federal Meteorological Branch and other provincial agencies was initiated in 1962 and has been continued since. The program consists of land pan stations near Imperial, Holdfast and Lumsden Beach, plus a water temperature installation on Last Mountain Lake at Rowan's Ravine.

During 1965 associated work by the Hydrology Division was limited primarily to monthly thermal surveys on the lake during the open water period. However, a start was made on processing and analyzing the data that has been collected in the field.

### **BASIN PLANNING SECTION**

#### *Moose Jaw Creek Basin Study —*

Continued requests by groups and individuals in the Moose Jaw Creek area to the Government and government agencies for water resource developments in the Moose Jaw Creek Basin, resulted in public hearings at the Moose Jaw Court House on June 17 and 18, 1965. Eleven submissions were heard which demonstrated strong need for a comprehensive study of the basin.

In view of these considerations, the Division began some preliminary studies during 1965 to assess the existing surface water supply situation in the basin and to assemble and review all relevant studies that have been undertaken in the basin to date. Some consideration was given to ways and means of undertaking a comprehensive study of the basin and its water requirements in co-operation with other agencies.

#### *Saskatoon-West Water Supply Project —*

At a meeting of the Saskatchewan Water Resources Commission early in October of 1965 it was decided that the Commission should develop plans to meet the water needs of potash companies and other potential users in the area south and west of the City of Saskatoon. There was an immediate demand for water by the Duval Corporation and Western Livestock (1958) Limited and a potential demand from several other potash companies and a number of towns and villages. In addition, it appeared that there was a potential for irrigation, for recreation developments and perhaps for other industrial demands.

These considerations and the recognition of the immediate needs for water for Duval and Western Livestock led to a preliminary investigation involving staff of the Hydrology Division with a view to providing an interim supply. Ground water supplies were found to be unsatisfactory and an overland supply from the river was found to be uneconomic. A pipeline extension from the City of Saskatoon water system was found to be acceptable, however, so a consulting engineering firm was hired, the necessary design and other requirements were met, and in December of 1965 the portion of the pipeline to Duval Corporation was constructed. This line will serve that firm's water needs for domestic purposes and shaft sinking operations, but after a larger supply is made available it will be used for domestic purposes only. Arrangements for extending this line to the Western Livestock site have not been completed at this time.

Steps were also taken with regard to development of a plan to meet the long-term needs of the area. On February 14 and 15, 1966, public hearings were held in the Court House in Saskatoon to hear submissions from all potential water users in the area. Some preliminary consideration was given to the scope and timing of a comprehensive study.

#### *Saskatoon-Southeast Water Supply Project —*

During 1965 investigations were undertaken of a proposed scheme for supplying water to potash industries, urban centres, irrigable areas and recreation and waterfowl developments in a 6,000 square mile area southeast of Saskatoon. As a result of conclusions and recommendations arising out of that study, the Government decided to proceed with the scheme. This project study is described in detail in a separate chapter of this report.

To undertake the study a small study group was formed comprised of representatives from the Economics Division, the Water Rights Branch, the Saskatchewan Research Council, the Department of Natural Resources, the Department of Agriculture and chaired by the Head of the Hydrology Division.

#### *City of Yorkton Water Supply —*

In response to requests from local groups in the Yorkton area for consideration of means to stabilize the water level in York Lake and concern by the City of Yorkton over the effect of inadequate water supplies on development of that city, a preliminary assessment of the water supply picture in the general area was made by the Basin Planning Section during 1965.

This preliminary assessment revealed that a number of agencies have been involved in studies and water developments in the area during the past ten or fifteen years. It also revealed the close interrelation of all existing and future water develop-

ments in the area and pointed up the need for a comprehensive study to develop a plan or plans for developments to best serve a wide range of users.

The immediate area of concern is bounded roughly by the Yorkton Creek Watershed. However, from work undertaken in the past it is evident that a comprehensive study would immediately involve a major part of the Whitesand River Basin of which the Yorkton Creek Watershed is a part. Of course, any significant development in the Whitesand River Basin, in turn, will affect developments on the main stem of the Assiniboine River which is an interprovincial stream. The two most obvious sources for augmenting water supplies in the Yorkton Creek Watershed would be the Qu'Appelle River and the Shellmouth Reservoir which is under construction on the main stem of the Assiniboine River in Manitoba. A study involving both Saskatchewan and Manitoba is presently in progress under the Prairie Provinces Water Board that may provide the framework for developing a formula for allocating or apportioning the waters of the Qu'Appelle-Assiniboine Systems.

In view of these considerations, it was concluded that any further surface water supply studies in the general area of Yorkton should be considered only within the context of a comprehensive Assiniboine River Basin Study.

#### *Saskatchewan River Delta Reclamation Study —*

The presently contemplated program for the Saskatchewan River Delta Reclamation Project calls for development, including dykes and drainage works, of a portion of the Delta Area in the near future. With this thought in mind the PFRA reports on this project were reviewed by the Hydrology Division with a view, primarily, towards determining what effect the South Saskatchewan and Squaw Rapids Reservoirs may have on the Delta Area. It was concluded that there is a need for additional, detailed hydrologic studies before any final plans are made.

#### *Miscellaneous Hydrologic Studies for Provincial Agencies —*

Some of the major studies which were undertaken are briefly discussed hereunder.

##### **1. Francis Slough Study —**

In response to a request by the Conservation and Development Branch of the Department of Agriculture, a hydrology study was undertaken to assess the flood runoff picture and to develop criteria for the design of drainage facilities for the Francis Slough Drainage Project. This scheme involves the drainage of several square miles of agricultural lands subject to flooding in the Francis Slough Marsh, and the adjacent Buhr and Kehler sloughs. Drainage will also benefit municipal roads in the area.

##### **2. Flowing Well Slough Drainage Project —**

This scheme involves the drainage of agricultural lands near the Hamlet of Flowing Well, into Wiwa Creek. A study was undertaken for the Conservation and Development Branch to determine the flood potential of streams draining to the project to provide information for design and construction purposes.

### 3. Jackfish Lake Project —

To determine the effects of a controlled outlet upon the permanency of water levels in Jackfish and Murray Lakes and to develop design criteria, a study of this project was undertaken for the Conservation and Development Branch. The assessment considered two alternative outlet elevations and operation procedures which would permit outflow at all times when the lake level exceeded full supply level and prevent it when the lake falls below that level. Agricultural and recreational developments are of concern in this project. Recreation development at both lakes is extensive and the Battlefords' Provincial Park is located on Jackfish Lake. In addition, farmers located on lands contiguous to the lake use these lands for hay production and their operations are affected by lake levels.

### 4. Cumberland Lake Levels —

At the request of the Conservation and Development Branch a study was undertaken to determine the probability of occurrence of various water levels on Cumberland Lake as a basis for design of a dyke on Farm Island. At the same time, a study was made to develop techniques for forecasting flood levels on Cumberland Lake using historical streamflow data. These studies are associated with the Department of Agriculture's program on Farm Island for the development of a small farming project in the area.

### 5. Wakaw Lake —

Requests from recreation interests at Wakaw Lake were made for the construction of works to stabilize lake levels. Subsequently, at the request of the Department of Natural Resources, a preliminary assessment of the project was made by the Hydrology Division. However, a detailed hydrologic study has been postponed, pending further studies by the Department of Natural Resources to evaluate the recreation potential of the area.

## ECONOMICS DIVISION

About three-quarters of the Division's time during 1965 was spent on the Saskatoon-Southeast Water Supply feasibility study. Other assignments were handled as time permitted during the study and after completion of the final Saskatoon-Southeast Water Supply Study feasibility report in September, 1965.

The year proved to be a challenging one because the economic analysis function as part of multi-purpose water supply feasibility studies was a new one to the staff. The tight deadlines imposed by the Saskatoon-Southeast Water Supply Study necessitated the development of techniques as work proceeded and restricted the path of work to the main stream of economic analysis. Little time was available for exploratory studies or for the development of new analytical techniques.

In addition to Saskatoon-Southeast Water Supply Study, several other assignments were handled on a project basis including preliminary studies of the Moose Jaw Creek Basin, a long range assessment of possible provincial water demands, revision of the South Saskatchewan Project cost allocation and several smaller studies and papers.

#### *Saskatoon-Southeast Study —*

By April 1, 1965, the resources of the Division were already heavily committed to the Saskatoon-Southeast study and remained so well into October. The work covered a number of areas; determination of industrial and municipal water demands; comprehensive benefit-cost comparison; allocation of costs; determination of financial feasibility; preliminary examination of pricing policy and charges for water; and preparation of an economic component report.

#### *Determination of Future Water Demands —*

At the outset of the study, it was necessary to provide forecasts of future water demands as a guide to engineering design and benefit analysis. The Economics Division provided demand estimates in two areas, industrial and municipal use, at two development levels — 1980 and year 2000.

The future pattern of growth in demand could not be accurately determined because it depends on so many variables. Several guidelines were developed, however, as an aid in the task. All potash companies with leases in the area under consideration were contacted and future requirement estimates requested. In addition, the Division prepared a separate report on potential world demand for Saskatchewan potash based on forecasting work of experts in the field and the judgement of provincial agencies involved in potash development. Potash demands were then related in terms of location, plant size and output to annual water withdrawal requirements in the Saskatoon-Southeast area.

The growth of water requirements to supply communities required an analysis of future population changes and changes in per capita demand. The growth trend of each community under study was plotted for the past fifteen years and projected to year 2000. New population induced by the potash developments were then added by use of a formula developed by the Community Planning Branch. Certain assumptions concerning per capita demands were made and this factor was then related to population to determine future water demands.

#### *Benefit-Cost Analysis —*

This work involved two separate analytical procedures. Initially, it was necessary to establish the benefits (equated with revenue potential) of the sale of water to potash and municipal users. Secondly, it was necessary to incorporate this information with benefit and cost information on other project purposes to provide an overall benefit-cost comparison over a twenty, thirty or forty year project lifetime.

The revenue potential of potash and municipal users was equated with the lesser one of two criteria; alternative cost of supply, or ability to pay. A series of revenue trials were then constructed in the form of revenue schedules to the year 2000. After taking uncertainty into account and resizing of the physical works to eliminate uneconomic segments, the revenue potential was fixed as a projection.

As cost and benefit data were received on project purposes and the design of physical works, the data was re-analyzed and formulated into a primary benefit-cost comparison in present worth terms. Secondary and indirect benefits and costs were taken into account in qualitative rather than quantitative monetary terms. As a result of the analysis of each purpose in turn, a revision of the maximum pipeline scheme was indicated to study the effect of eliminating certain municipal

and industrial segments. The benefits and costs of each purpose were then combined, salvage value of physical works was taken into account and an overall benefit-cost tabulation and ratio prepared. The results justify the development of the project at the feasibility level over a thirty year lifetime or longer.

*Cost Allocation and Financial Feasibility —*

In most projects of a multi-purpose nature, some purposes will be revenue-producing, such as industrial and municipal supply, while other purposes such as recreation and waterfowl production will be non-revenue-producing. Certain costs are incurred to provide water supply to one purpose only, other costs are joint to several purposes and must be allocated equitably. It is then possible to identify that portion of the project costs which must be recovered from revenue-producing purposes.

The Division allocated Saskatoon-Southeast Water Supply costs in proportion to the volume of water used by each purpose over the project lifetime. A series of financial studies were then undertaken to determine cash flows in each year of operation and the share of costs to be repaid with interest over the project lifetime by these cash flows. As a result of these studies, it was possible to determine a break-even point in project operations, the approximate rate of return on loans to be used to construct facilities serving reimbursable purposes, and the share of costs to be treated as non-reimbursable.

As a result of the above analyses, it was possible to forecast the magnitude of financing required and the borrowing arrangements which would be desirable.

*Pricing Policy —*

From cost allocation and financial feasibility studies it was possible to draw conclusions and make recommendations on the charges to be levied for water used. Clearly, as the project proceeds through the design and construction stage, financial feasibility and the level of charges for water can be defined more precisely.

*Moose Jaw Creek Watershed Study —*

During the latter part of the year under review, the Division undertook a preliminary survey of the economic activities, municipal and industrial water requirements of the Moose Jaw Creek Drainage Basin.

The study considered the basic population pattern and significant characteristics of the economy. From this work, future population changes were estimated and possible future municipal and industrial water requirements forecast.

This work is expected to form part of the first stage of a comprehensive basin study of the Moose Jaw Creek Drainage Basin.

*Revision of South Saskatchewan Cost Allocation —*

A considerable amount of work had been undertaken prior to 1965 on the allocation of Saskatchewan's share of the costs of the South Saskatchewan Reservoir. It was recognized that the water demands on the reservoir have been changing rapidly and an opportunity was taken to update the allocation by modified volume of use method in line with latest anticipated demands.

The results showed that charges for the use of water from the reservoir may

will be constructed in the Blackstrap Valley near Dundurn. Its location, less than 30 miles from Saskatoon and adjacent to a major provincial highway, makes it attractive as a water body for recreation purposes. The reservoir has been designed and can be operated to maximize its recreation potential. A study has been completed by a qualified recreation consultant and it confirms both the potential and a great unsatisfied demand for additional public recreation outlets in the Saskatoon region. To ensure best use of the adjoining lands, the Division will develop land use regulations for recommendation to the Commission and the Government.

A request has been received from the Qu'Appelle Valley Development Association for assistance in developing land use control measures around the chain of lakes in the Qu'Appelle and Last Mountain Lake. The Department of Natural Resources has engaged a recreation consultant to study future recreation needs in this area. When this study is complete, the Commission will consider its recommendations in conjunction with streamflow management in this system.

Typical Stock Watering Dam



SWRC Photo

Radial Gate — Val Marie Reservoir



SWRC Photo

# WATER RIGHTS BRANCH

## Chapter IV

The basic function of the Water Rights Branch is to administer The Water Rights Act, The Ground Water Conservation Act and The Water Power Act and their respective regulations. This is the 35th annual report of the office responsible for the allocation of our provincial water resources.

### FUNCTION CHART

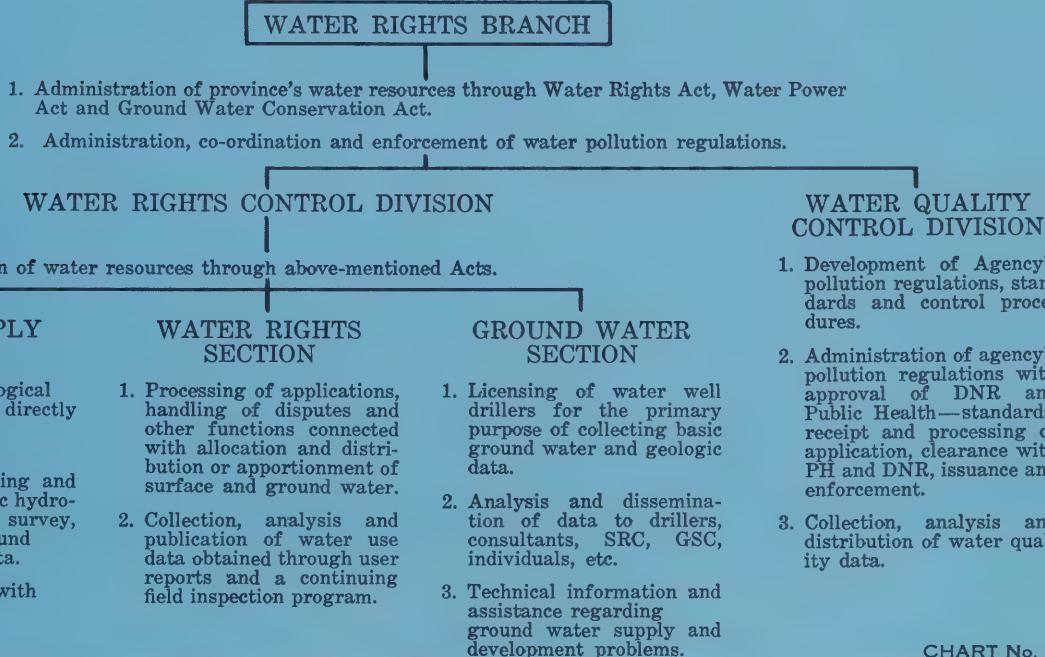


CHART NO. 1

### WATER RIGHTS CONTROL DIVISION

This Division is responsible for processing of applications connected with the allocation, apportionment and distribution of water, and the investigating of illegal impoundment or diversion of water.

### WATER RIGHTS SECTION

This year there was a marked decrease in the number of applications received for the right to divert and use water. This was due to timely precipitation throughout the province, especially in the watersheds of the southwest.

Applications received for the use of surface water totalled 255 as well as applications for the use of ground water. Surface water applications were mainly for domestic and irrigation purposes, a limited number were requested for municipal and industrial uses. The ground water applications were for municipal and industrial purposes.

Considerable time was spent by staff in preparing a water rights section to the Prairie Farm Rehabilitation Administration field office manual. This section outlines the information and details required on plans and reports submitted by Prairie Farm Rehabilitation Administration field staff. These plans and reports are submitted as part of applications for the use of water and are of concern to the Prairie Farm Rehabilitation Administration because that agency provides financial assistance for water development projects.

This year the use of prepared linens was initiated allowing the final drafting to be done in the field.

*Field Administration Problems —*

A heavy runoff was experienced in the west half of the province and several complaints of flooding were inspected, others were handled by correspondence. Late summer rains resulted in several flooding complaints and some field inspections were required in the southwest and in the northeast parts of the province. Much of this flooding was due to the construction of ditches or the natural accumulation of "blow-dirt".

No complaints were received regarding over-diversion.

*Field Inspection Program —*

Field staff again concentrated on the southwest part of the province. Follow-up inspections were continued in the Frenchman River Basin and the Lodge Creek Basin. A total of 298 projects were inspected. These inspections are undertaken to review the water use of each project and to review and make amendments to Water Rights Branch's plans and files. A total of 28 small surveys were undertaken to complete these follow-up inspections.

*Reservoir Management —*

Due to runoff conditions and summer rains the reservoirs of the province were maintained at high levels with a minimum amount of withdrawal. No supervision was required in regard to serving flood rights below reservoirs since ample water was available.

## **WATER STUDIES SECTION**

The Water Studies Section provides the specialized hydrologic services associated with water rights functions, such as water supply studies connected with applications for the use of water. It also collects, processes and distributes the basic hydrometric, meteorological, snow survey, sedimentation and similar data.

An adequate continuing knowledge of the location, distribution and adequacy of water is a basic prerequisite to efficient water resources administration.

The head of the Water Studies Section is the Saskatchewan member of the Advisory Committee in Prairie Surface Water Data, a continuing committee formed by the federal Water Resources Branch. This committee's terms of reference are:

1. "To examine and co-ordinate the surface water data requirements of each of the three Prairie Provinces.
2. To compile the most desirable overall surface water data program for implementation during the following fiscal year and to review this program when federal and provincial commitments have been made respecting the availability of funds and personnel.



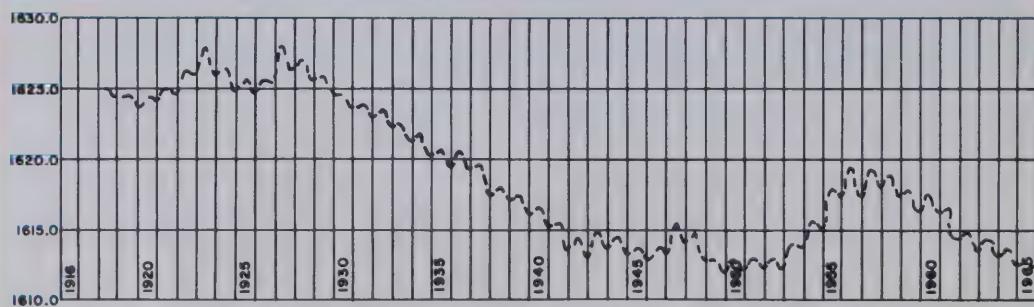
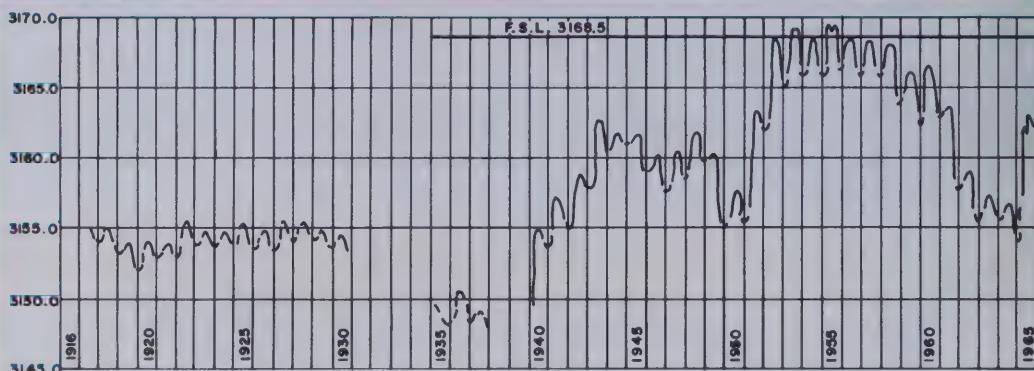
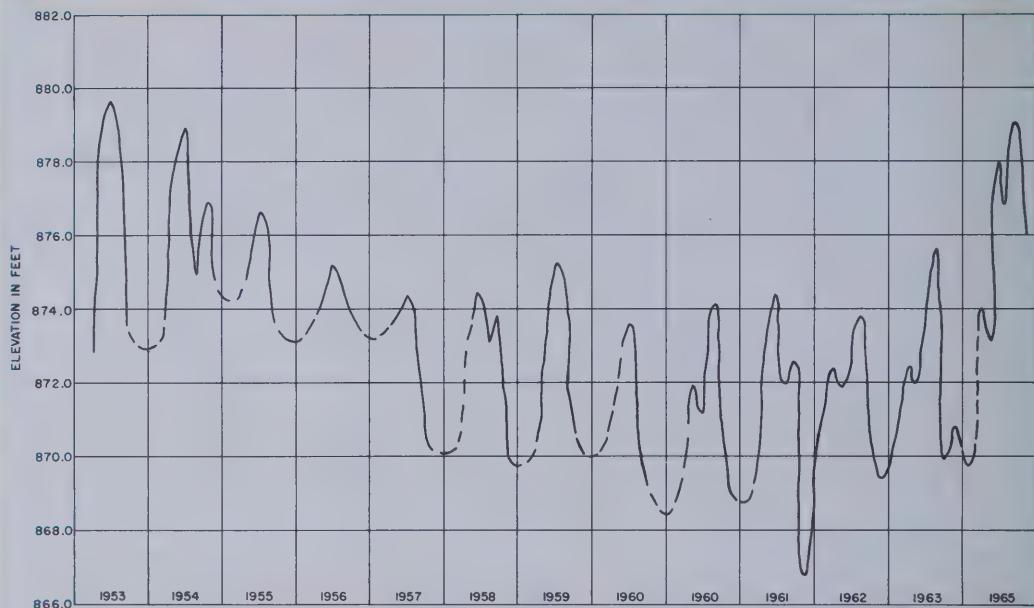
Water Rights Branch Technician Measuring the Discharge of Wascana Creek Using a Current Meter

3. To review and advise on cost-sharing arrangements on stations of value to more than one province."

This committee met twice in 1965.

During the past year several continuing programs were handled. These were:

1. The Conservation and Development Branch of the Department of Agriculture gauging program with 75 hydrometric stations measuring the spring runoff period. Tabulation of this hydrometric data obtained up to and including 1965 was completed. This will be published in 1966 as an appendix to the report on the hydrometric gauging network.
2. The Department of Natural Resources lake gauging network providing open water lake level records on 25 recreational lakes in Saskatchewan.
3. The Wascana Lake sedimentation study that measures sediment inflow on Wascana Creek near Richardson to estimate the long-term potential sediment load. In 1965 a total discharge of 11,440 acre-feet was recorded with only minor sedimentation.
4. Streamflow measurements on the South Saskatchewan.



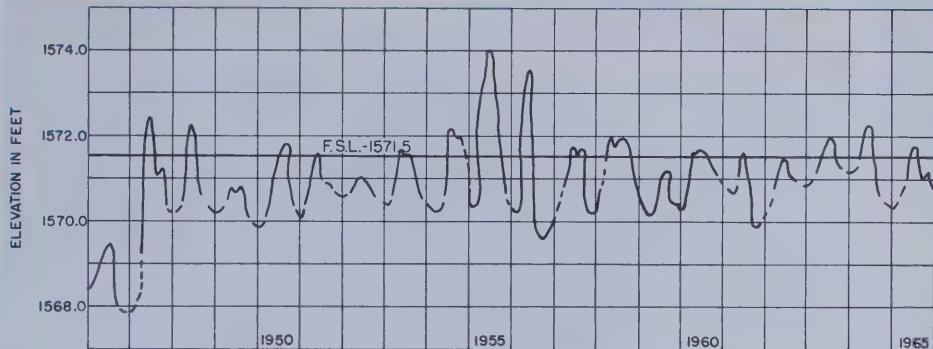


Figure 6—LEVELS OF ECHO LAKE

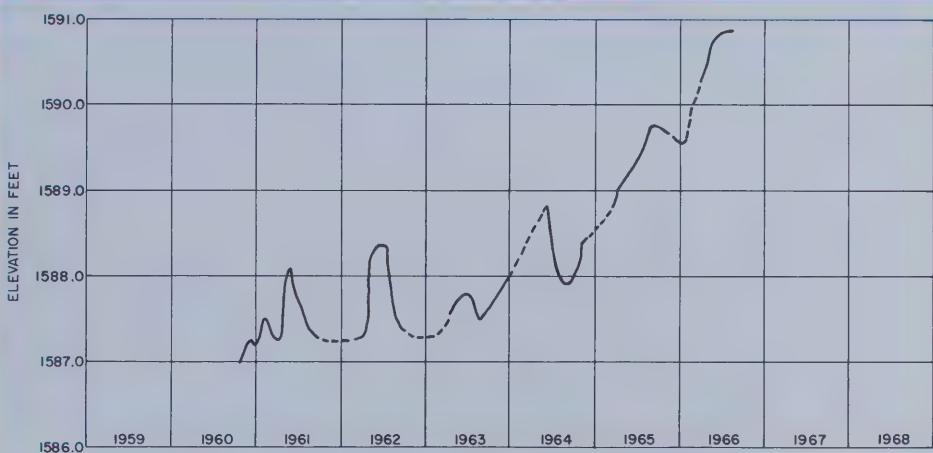


Figure 7—LEVELS OF EMMA LAKE

In 1965 gauge heights were recorded at 13 stations (including five at which an automatic recorder was used and 25 hydrometric measurements were made). These results will be published in the spring of 1966.

Water supply studies were also made of the surface water potential of Kenosee and Carlyle Lakes, Weyburn Reservoir, the Red Deer River near Hudson Bay, the Humboldt area, and, in conjunction with the Water Quality Control Division, four possible sites for a proposed pulp and paper mill in the Prince Albert area.

A study was made of small domestic projects on Lodge Creek, Battle Creek, and the Frenchman River to aid the federal Water Resources Branch in choosing several representative projects to determine the extent of domestic project use in these critically water-short international basins.

Several minor studies were undertaken during the year. These included 24 flood potential studies, 22 water supply studies and 30 miscellaneous studies. Some of these studies were requested by such agencies as the Departments of Highways, Municipal Affairs, Natural Resources, and Agriculture.

## GROUND WATER SECTION

The Ground Water Section is responsible for the administration of The Ground Water Conservation Act which includes the licencing of water well drillers, the collection, processing and distribution of data on the province's ground water resources and the geohydrologic studies involving aquifer evaluation and ground water conservation aspects.

It is estimated that 50 million gallons per day (180 acre-feet) of ground water is being used. A program of systematic ground water research with regard to occurrence of ground water supplies has delineated a number of significant aquifers in which it is essential to practice sound conservation aspects. In recent years the demand for, and the use of, ground water supplies by urban municipalities and industries, in addition to a farm water and sewage program, has increased at a rapid rate. A major project over the year has been a thorough study of required regulations which would provide for the orderly exploration and development of the province's ground water resources, minimizing pollution and contamination problems in aquifers, and in addition provide more accurate data on ground water behavior and use so that intelligent long-range planning of the use of the provincial resource can be undertaken.

One hundred and forty-one water well drillers were active in the province this year. This represents a decrease of fourteen from the last fiscal year. The number of full time drillers remained constant and it is interesting to note that the full time drillers, comprising about 50 per cent of the total number, drilled about 90 per cent of the reported footage, which amounted to 250,000 feet. The precipitation over the province during the last two years has been above the long-term average resulting in fewer active drillers and footage drilled. Surface water supplies, such as dugouts, dams and ponds have met more of the water demand. It is estimated that the total value of drilling in the province during the year was in excess of 1.5 million dollars.

A total of 1,860 water well reports were received. A total of 124 probability reports including ten for municipal and three for industrial use were prepared. An annual report of water wells reported during the year was published and distributed.

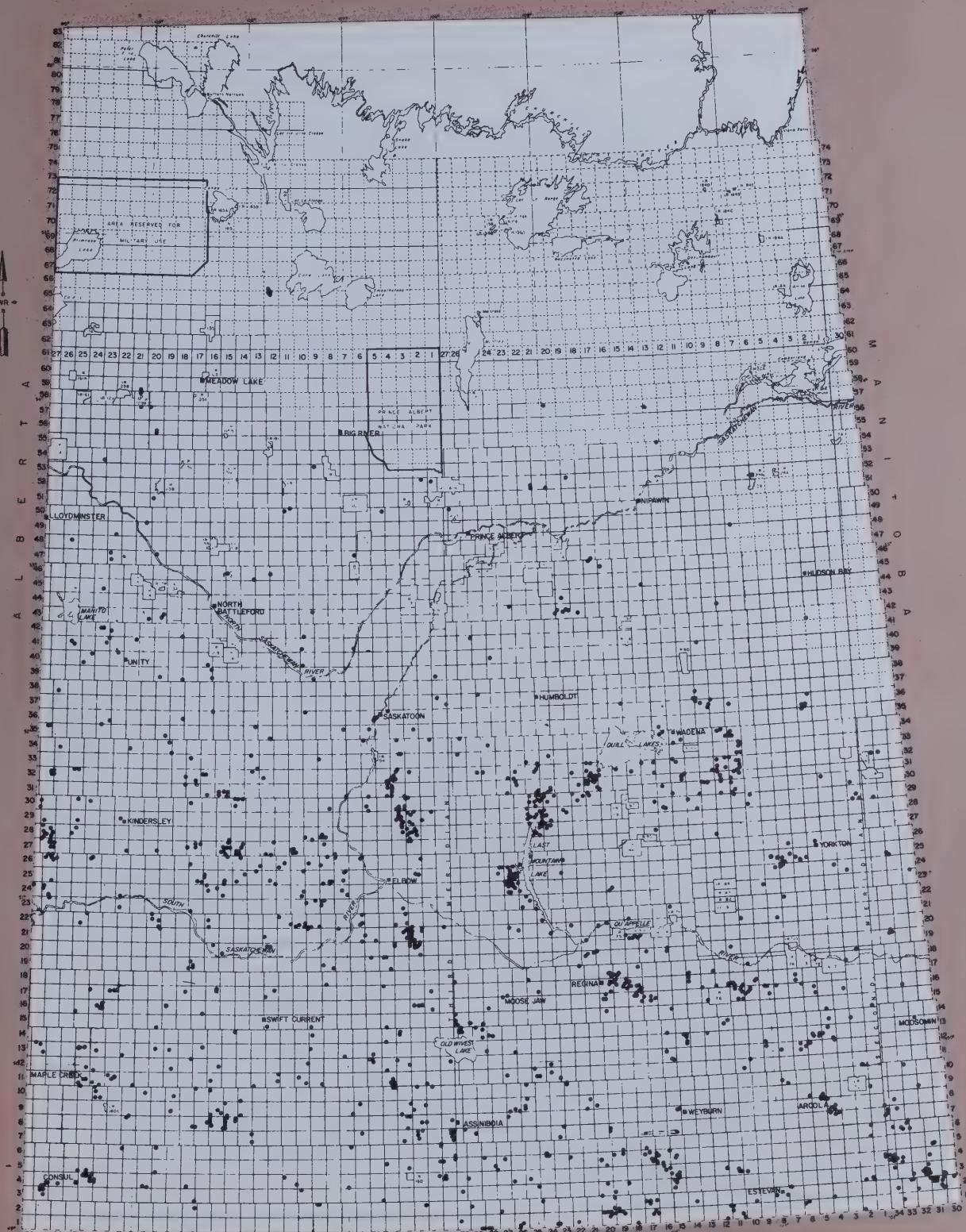
Ground Water staff participated in eight pump tests, for small urban centres, in order to evaluate existing or potential ground water supplies.

Technical assistance in the form of geological interpretations, water quality analyses, well development, spring development and exploration techniques were provided in the field on 12 occasions. Three proposals for the use of ground water for irrigation schemes were inspected, and were found to have insufficient supplies of water. A few artesian wells were inspected during the year in order to assess flooding damages, one being a well south of Midale in the Souris Valley flowing into Dead Lake at approximately 500 gallons per minute.

Staff from the Ground Water Section participated in the annual short course provided for well drillers held in Saskatoon in March. This Section also participated in two exhibitions, each of one week's duration, sponsored by the Saskatchewan Department of Agriculture.

Approximately 75 sand analyses and 25 water sample analyses were conducted.

A meeting between Noranda Mining Company, its ground water consultants, and the farmers who have wells in nearby aquifers, was attended and a monitoring system discussed with a view to forecasting any significant water level declines and to further evaluate the performance of the aquifer as it is being pumped.



AREAS IN WHICH FLOWING ARTESIAN WELLS OCCUR

FIGURE 1

1965

**SUMMARY OF PROGRESS UNDER GROUND WATER  
CONSERVATION ACT**

Number of Licensed Drillers .....	141
Full time .....	77
Part time .....	40
Occasional .....	24
Number of Drilling Rigs .....	198
Rotary .....	114
Boring .....	44
Cable Tool .....	35
Other .....	5
Total Footage Reported .....	249,863
Notice of Drilling Received .....	281
Driller's Reports Received .....	1,860
Formation Samples Received .....	1,717
Ground Water Data and Probability Reports .....	124
Domestic .....	111
Municipal .....	10
Industrial .....	3
<b>SUMMARY OF NUMBER OF WELLS REPORTED*</b>	
Domestic .....	1,397
Municipal .....	68
Industrial .....	22
Irrigation .....	0
Test holes** .....	362
Total .....	1,848

\* Includes "dry" and test holes reported.

\*\* Mainly for ground water surveys.

**WATER QUALITY CONTROL DIVISION**

The Water Quality Control Division has the responsibility of developing and administering a water quality management program for the province. Development of the program includes the formation of a policy guide on pollution control, regulations for pollution control and stream and effluent quality criteria in conjunction with the Department of Public Health and the Department of Natural Resources. Administration of the program will include report writing, negotiations, and technical assistance to industries and municipalities, checking plans and specifications and the issuance of permits. This will involve inspection, investigation and enforcement.

The first responsibility was to develop a pollution control program. A start was made by obtaining relevant legislation from the other provincial pollution control agencies in Canada and several parallel agencies in the United States. Experience elsewhere suggests that the best approach to follow in developing a water quality control program involves three phases: policy formulation; establishment of water quality criteria or standards; and finally, the drafting of regulations.

The Division participated in the preparation of a background paper for the Canadian Council of Resource Ministers Conference on Pollution Control, 1966. The paper covered two main aspects, provincial organizations controlling pollution, including legislation and regulations, and the pollution situation in Saskatchewan.

The paper showed that there are still six municipalities with a total population of 146,000 which discharge untreated sewage to water courses. The total urban population in Saskatchewan is 584,000 and sewage treatment facilities are provided for 407,400 urban residents.

The Division prepared a report on dilution water requirements in Moose Jaw Creek in connection with a comprehensive Commission study on the possible development of Moose Jaw Creek. The Division will continue to participate in this study as it proceeds.

## INTERPROVINCIAL STREAMS

The Prairie Provinces Water Board held meetings in Regina on April 15, 1965, Winnipeg on September 21, 1965, and Edmonton on February 8, 1966.

The Board was unable to reach unanimous agreement concerning Alberta's request for an increased allocation. At the Chairman's suggestion, the question was referred to the respective ministers for study and advice, since the matter concerned mainly Alberta and Saskatchewan.

The Apportionment Committee, established in 1964, submitted its report to the Board at the February meeting. This report will be used as a basis for further studies of the apportionment problem.

The ad hoc committee established to determine terms of reference to use in studying the interagency co-ordination of data network planning submitted its report to the Board on February 8, 1966. The formation of the Network Committee recommended in the report was deferred pending further study of the recommendations.

## INTERNATIONAL STREAMS

In Lodge Creek, Battle Creek, Frenchman River and Souris River Basins, Saskatchewan is entitled to divert and use 50 per cent of the natural flow originating in Canada. The remainder must be passed to the United States under terms of orders of the International Joint Commission.

Unusually high precipitation during the summer months of 1965 caused higher than average flows in all four drainage basins. Computed natural flow in the Souris River Basin was 88,269 acre-feet of which Saskatchewan diverted only 6,149 acre-feet or about 7.0 per cent. In the Frenchman River Basin the computed natural flow was 107,140 acre-feet of which 30,074 acre-feet or 28.0 per cent was used in Saskatchewan. The Battle Creek Basin computed natural flow was 54,520 acre-feet of which 27,091 acre-feet or 49.6 per cent was diverted in Saskatchewan. Lodge Creek, due partially to an unusually heavy rainstorm in June, produced a computed natural flow of 77,350 acre-feet of which Saskatchewan and Alberta diverted 22,175 acre-feet or 28.7 per cent. (See Figure 2).

At the invitation of officers of the federal Water Resources Branch, representatives of the U.S. Geological Survey, the Montana State Water Conservation Board and the Saskatchewan Water Rights Branch met in Calgary on September 28, 1965, to discuss problems associated with the computation of natural flows of the Saskatchewan tributaries of the Milk River. Subsequently, several index reservoirs were selected in these basins to provide an estimate of the water stored for stockwatering and domestic purposes. A map was prepared showing both the gross drainage area and that which would effectively contribute to flow in an average year in the Battle Creek and Frenchman River Drainage Basins.

The collection of data from minor irrigation users in Frenchman River, Battle

Creek, and Lodge Creek Drainage Basins in Saskatchewan was continued. This information is used for administration purposes and by the federal Water Resources Branch in estimating annual minor diversions on these streams and are published by the federal Water Resources Branch.

Because of a more favourable runoff pattern and continued co-operation between federal and provincial agencies, the administration problems in these basins in 1965-66 were minimal throughout the irrigation season.

FIGURE-2 SHOWING PERCENTAGE OF NATURAL FLOW DIVERTED  
IN SASKATCHEWAN ON INTERNATIONAL STREAMS  
IN 1965

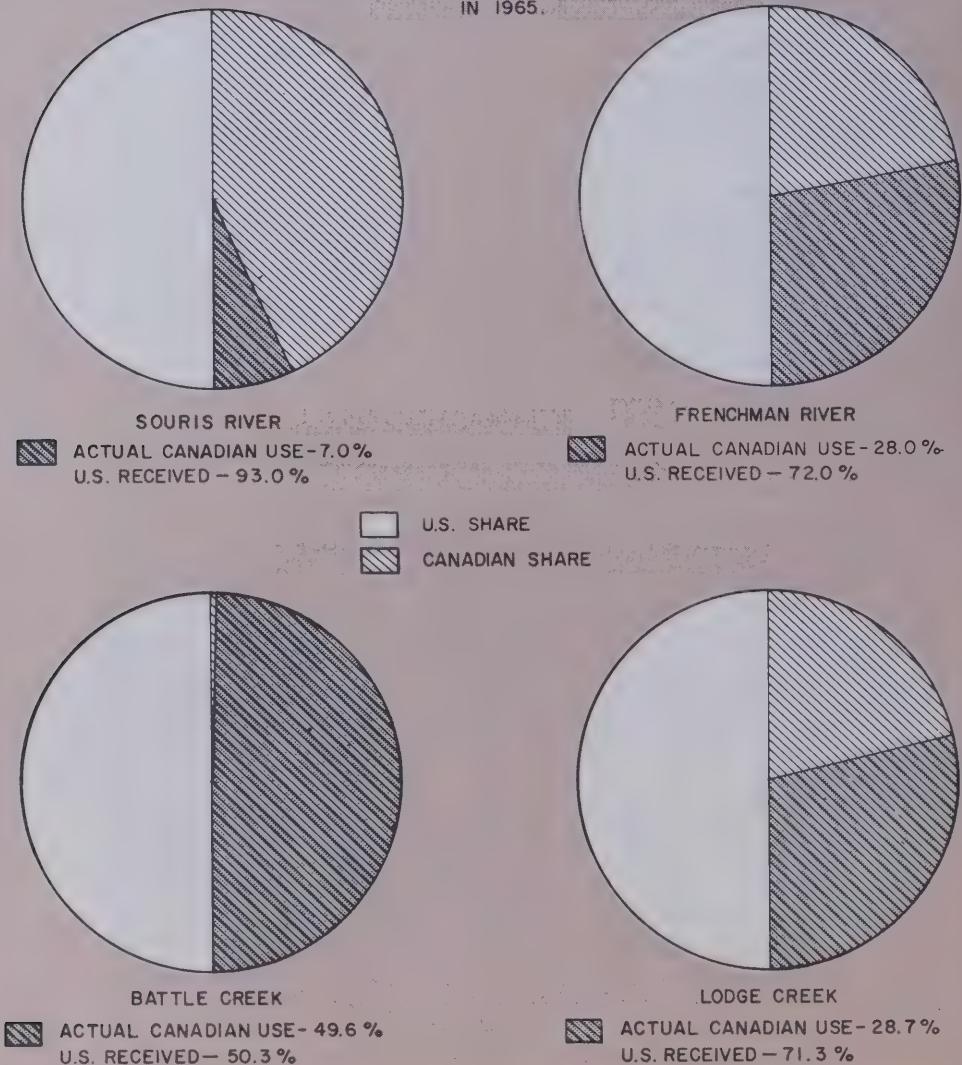


TABLE 1—DRAINAGE BASINS SHOWING WATER STORAGE PROJECTS DEVELOPED  
UNDER PROVISIONS OF THE WATER RIGHTS ACT TO MARCH 31, 1966

Drainage Basin		Domestic		*Irrigation		Municipal & Industrial		Total		†Authorized Ducks Unlimited (Canada) Projects	
		No.	Name	No. of Projects	Storage Acre-Ft.	No. of Projects	Storage Acre-Ft.	No. of Projects	Storage Acre-Ft.	No. of Projects	Storage Acre-Ft.
1.	Lodge Creek.....	44	383	15	13,411	2	9	61	13,803	...	...
2.	Battle Creek.....	194	1,573	26	3,791	3	56	223	5,420	2	1,870
3.	Frenchman River.....	333	2,083	50	90,168	3	705	386	92,956	3	621
4.	Many Island Lake.....	87	512	5	254	...	...	92	766	...	...
5.	Bigstick Lake.....	126	847	28	20,294	...	...	154	21,141	2	1,630
6.	Hay Lake.....	4	7	2	234	1	10	7	251	...	...
7.	Crane Lake.....	40	188	7	37	3	130	50	355	...	...
8.	Lake of the Narrows.....	26	185	6	136	...	...	32	321	1	70
9.	Antelope Lake.....	31	179	4	35	...	...	35	214	4	1,440
10.	Swiftcurrent Creek.....	143	4,138	29	85,338	9	558	181	90,034	...	...
11.	Old Wives Lake.....	1,127	7,725	102	40,432	14	714	1,243	48,871	11	580
12.	McRaw Coulee.....	13	179	3	90	...	...	16	269	...	...
13.	Woodpile Coulee.....	15	148	1	2	...	...	16	150	...	...
14.	Lyons Coulee.....	26	331	3	9	...	...	29	340	1	908
15.	East Branch Battle Creek.....	45	164	1	4	...	...	46	168	...	...
16.	Whitewater Creek.....	154	1,288	8	69	1	35	163	1,392	...	...
17.	McEachern Creek.....	44	795	8	153	...	...	52	948	...	...
18.	Horse Creek.....	4	19	...	...	...	...	4	19	...	...
19.	Roch Creek.....	5	27	...	...	...	...	5	27	...	...
20.	East Branch Poplar River.....	53	383	12	1,615	...	...	65	1,998	...	...
21.	Middle Branch Poplar River.....	21	133	1	1	...	...	22	134	...	...
22.	West Branch Poplar River.....	4	12	...	...	...	...	4	12	...	...
23.	Qu'Appelle River.....	774	12,075	36	106,217	78	11,489	888	129,781	15	2,162
24.	Souris River.....	332	9,082	31	15,219	31	65,304	394	89,605	2	315
25.	Manit Lake.....	32	1,444	...	...	...	...	32	1,444	1	163
26.	Lenore Lake.....	15	67	4	72	1	1	20	140	...	...
27.	Quill Lake.....	37	289	1	16	2	130	40	435	6	6,833
28.	Carrot River.....	16	64	...	...	22	7,716	38	7,780	1	5,964
29.	North Sask. River.....	446	2,964	23	455	71	6,342	540	9,761	8	8,074
30.	South Sask. River.....	496	3,436	31	940	35	1,419	562	5,795	1	37
31.	Assiniboine River.....	121	659	6	11	19	1,854	146	2,524	1	8
32.	Shoal River.....	2	13	...	...	12	618	14	631	...	...
33.	Red Deer (Sask.) River.....	12	73	...	...	38	1,393	50	1,466	...	...
34.	Churchill River.....	2	4	...	...	21	606	23	610	...	...
35.	Athabasca River.....	...	...	...	...	...	...	...	...	...	...
36.	Great Sandhills Group.....	119	1,022	11	403	...	...	130	1,425	4	722
37.	Willowbunch Group.....	170	1,127	19	167	5	341	194	1,635	1	779
38.	Rush Lake.....	65	1,065	11	9,133	...	...	76	10,198	...	...
39.	Wildhorse Lake.....	...	...	...	...	...	...	...	...	...	...
40.	Climax Group.....	94	1,145	15	236	1	2	110	1,383	2	166
41.	Tate Lake.....	34	393	5	366	1	7	40	766	2	2,564
42.	Bluff Creek.....	15	177	...	...	...	...	15	177	...	...
43.	Coal Creek.....	1	1	...	...	...	...	1	1	...	...
44.	Paisley Brook.....	52	315	1	2	...	...	53	317	...	...
45.	Big Muddy Lake.....	126	801	12	150	...	...	138	951	4	2,038
46.	Missouri Group.....	53	471	5	204	...	...	58	675	...	...
47.	Fife Lake.....	17	87	5	30	...	...	22	117	...	...
48.	Shoe Lake Group.....	61	267	12	216	3	110	76	593	...	...
49.	Green Lake.....	1	16	...	...	...	...	1	16	...	...
50.	Tannahill Lakes.....	8	39	1	5	...	...	9	44	...	...
51.	Udal Lake.....	5	18	...	...	...	...	5	18	...	...
52.	Morse Group.....	104	474	10	113	1	75	115	662	...	...
53.	Whitebear Lake.....	56	418	6	164	1	122	63	704	10	964
54.	Coteau Group.....	20	316	1	10	...	...	21	323	4	315
55.	Luck Lake.....	20	212	4	98	...	...	24	310	...	...
56.	Goose Lake Group.....	74	626	9	222	2	44	85	892	2	788
57.	Red Deer (Alta.) River.....	3	11	1	15	...	...	4	26	...	...
58.	Kindersley Lake Group.....	296	4,626	21	551	11	835	326	6,012	12	1,818
59.	Whiteshore Lake.....	30	317	1	34	2	290	33	641	1	114
60.	Redberry Lake.....	13	92	1	2	...	...	14	94	3	2,503
Total 60 Basins.....		6,261	65,505	594	391,124	393	100,915	7,248	557,544	104	43,451

\*This only includes irrigation projects with storage provided; there are many more without storage. See Table —.

†Ducks Unlimited (Canada) projects are not included in the totals shown.

TABLE 2—WATER ADMINISTRATION PROGRESS DURING THIS FISCAL YEAR

Water Administration Work Done	Stock Watering Dams	Irrigation Projects	Miscellaneous Water Development	Total
Applications Received Surface Water.....	86	138	31	255
Applications Received Ground Water.....			20	20
Authorizations Granted Surface Water.....	88	67	6	161
Authorizations Granted Ground Water.....			32	32
Water Licences Issued (Water Rights).....	126	96		222
Applications on Hand Pending Inspection.....	533	1,021	435	1,989
Authorizations in Good Standing.....	957	684	317	1,958
Licenses in Good Standing.....	5,315	2,038	242	7,595
Water Rights Inspections of Existing Projects.....	206	87	5	298

Ice Permits Issued: Commercial— ; Domestic— ; Total—

On March 31, 1966, there were 2,744 small irrigation projects in good standing comprising a total of 103,092 irrigable acres. The total irrigable area in large projects was approximately 87,100 acres.

Ground water applications and authorizations have not been listed in previous annual reports. Total number of applications received for ground water to March 31, 1966 was 65 — and the number of authorizations totalled 37.

TABLE 3—STREAM FLOW OF MAJOR STREAMS OF SASKATCHEWAN

Stream Name	Flow—Acre-Feet			
	1963	1964	1965	Estimated Average*
Lodge Creek.....	6,090	4,150	55,180	19,195
Battle Creek.....	4,610	5,410	27,530	18,570
Frenchman River.....	33,880	10,780	77,070	54,231
Whitewater Creek.....	222	62	415	885
McEachern Creek.....	5,040	5	9,240	5,362
Rock Creek.....	16,560	2,440	14,740	10,750
East Branch Poplar River.....	8,560	4,560	8,770	11,100
Middle Branch Poplar River.....	29,370	4,190	5,580	11,015
Souris River near Sherwood.....	19,330	38,260	81,160	61,150
Moose Mountain Creek at Oxbow.....	5,910	10,610	8,430	12,530
Souris River near Estevan.....	1,860	15,450	70,180	31,600
Saskatchewan River at The Pas.....	12,693,000	13,927,800	22,410,000	16,840,750
North Saskatchewan River at Prince Albert.....	6,467,000	5,752,000	10,210,000	6,307,250
South Saskatchewan River at Saskatoon.....	5,328,000	6,258,000	8,880,600	6,722,600
Assiniboine River at Kamsack.....	22,740	30,610	127,500	137,250
Whitesand River near Canora.....	2,050	3,930	27,260	47,650
Yorkton Creek near Ebenezer.....	1,170	2,340	6,210	11,000
Churchill River at Island Falls.....	18,554,000	17,562,000	19,540,000	18,750,000
Fond-du-Lac River at Outlet from Black Lake.....		8,300,000	7,768,000	7,045,000
Qu'Appelle River near Tantallon.....	41,010	35,480	49,470	69,200

\*Median flow based upon the period 1911-1956 inclusive.

# THE SOUTH SASKATCHEWAN PROJECT

## Chapter V

The Water Resources Commission Act provides for the designation of dual or multi-purpose water development projects by the Government for the purpose of co-ordination of the planning and development work. All multi-purpose projects involve interagency and, in some cases, interprovincial and federal-provincial co-ordination. The purpose of this co-ordination is to ensure that overall government policy objectives are realized in each development and to maximize benefits in relation to development costs.

When a project is designated and referred to the Saskatchewan Water Resources Commission, the Commission prepares, in co-operation with the program agencies, an overall development plan. The program agencies report progress regularly through their representatives on the Commission. Annually, these agencies are requested to review their long-term projections. The Commission reviews these revised plans in terms of their relationship to the overall development plan. The Commission advises the Government on the financial and personnel requirements to carry out the program objectives.

Good progress was made during the year on the development of the benefit phases of the South Saskatchewan River Project. Activity related to the reservoir construction was co-ordinated with the PFRA through the South Saskatchewan River Development Board. The staff of the Commission provided the avenue of liaison on a day-to-day basis between officials of the two governments. The forecast completion date of the basic reservoir works remained unchanged at late 1966. Schedules for the irrigation, power and recreation development remained basically unchanged.

During the year, a supplementary agreement covering the power installations was approved by the two governments.

### LAND USE

The Commission has the responsibility for recommending land use regulations to control developments in a limited area around the perimeter of the future reservoir. These regulations have a three-fold purpose: to minimize any damage to structures due to flooding, wave action, slumping and sedimentation; to ensure that developments are located so as not to interfere with reservoir operation; and to guide developments of various lands into shoreline areas most suitable for the particular purpose.

During the year a number of applications for relocations of farms and ranches affected by reservoir flooding were processed. A development permit was issued to the Saskatchewan Council, Girl Guides of Canada for a summer camp near Hitchcock Coulee south of Birsay.

A continuing inability to recruit suitably trained staff for the Land Use Division resulted in no further work being done toward the updating of the Reservoir Development Area regulations. However, at year end, a junior regional planner had been recruited and arrangements made for the appointment of the division head by mid-1966. There is a definite need to revise the existing zoning scheme to meet recreation, commercial and industrial demands which will develop as the reservoir fills.

### RESERVOIR OPERATION

The reservoir filling schedule calls for filling to elevation 1,790' by July 1, 1967. Elevation 1,790' represents the minimum elevation that will permit pumping reser-



PFRA Photo

Aerial photograph showing main dam and countryside looking southeast

ervoir water through the east side pump plant to the Outlook-Broderick irrigation canal and hence to the Saskatoon-Southeast Water Supply Project. The work under way and scheduled is developing (i) reservoir operation procedures; (ii) a master plan for administration and operation of the reservoir; and (iii) a plan for the integrated operation of the Qu'Appelle and South Saskatchewan River Systems. The status of these plans and other work in relation to operation of the South Saskatchewan Reservoir are reported on in Chapter III.

#### **PUBLIC INFORMATION**

In co-operation with the PFRA, the Commission co-ordinates a public information program concerning progress of construction and future plans for the project.

During 1965, the tourist pavilion at the main dam site was visited by 88,500 persons. Picnic facilities operated by the Department of Natural Resources at both the main dam and Qu'Appelle River dam sites proved popular areas for the relaxation of visitors to the project. Approximately 40,000 copies of a joint information booklet on the project were distributed at the tourist pavilion and to interested persons through federal and provincial offices in the province.



Aerial view of main dam site  
1. PFRA headquarters  
2. Construction campsite  
3. Observation pavilion  
4. Power house site  
5. Spillway  
6. Control towers

The public was further kept informed through press releases, articles in technical and other journals and through speaking engagements by Commissioners and staff.

A half-hour colour documentary film, "Harnessing the South Saskatchewan" is available for public use from the Visual Education Branch, Saskatchewan Department of Education, or the local National Film Board offices.

## RESERVOIR CONSTRUCTION

The last major contract in the reservoir works — the spillway chute and stilling basin at the main dam — was awarded on April 1, 1965. By March 31, 1966, 50 contracts with a total value of \$111 million had been let by the PFRA, the agency responsible for design and construction of the main reservoir works.

By April 1, 1966, the final two embankment stages at the main dam were 99 per cent and 81 per cent completed, respectively. Some 3.2 million yards of embankment remained to be placed. At year end consideration was being given to extending the remaining embankment work over the whole of the 1966 construction season.

Good progress was made during the year on the construction of the spillway chute and stilling basin and it was expected that the contract completion date of October 31, 1966, would be met. The installation of the spillway gates and hoists was forecast for completion prior to October 31, 1966.

Work on the Qu'Appelle River Dam was 81 per cent complete by year end. Some 20 million yards of excavation, 200,000 tons of filter material and 285,000 tons of slope protection remained to be placed. Some difficulty was being experienced in securing larger sizes of rock for riprap purposes and the completion date of June 15, 1966, might have to be extended.

Reservoir clearing was 90 per cent completed at year end and completion is expected on May 15, 1966.

PFRA Photo

Construction on the downstream side of the spillway gates

PFRA Photo

Earth moving equipment working on downstream side of dam between control gates and external penstocks

The contractors' labour force varied considerably during the year with the peak exceeding 800 in June and declining to 200 persons in January. On March 31, 1966, 393 persons were employed by contractors and the PFRA staff on site totalled 196 persons.

Assuming the present construction schedule is maintained, the basic reservoir works will be completed late in 1966. Based on river flows, there is a 50 per cent chance that the reservoir will be filled to elevation 1,755 by late 1966, and to full supply level of 1,827' late in 1967.

## **IRRIGATION**

In July, 1964, the Government of Saskatchewan made a decision to proceed with rapid development of a 40,000-acre irrigable block in the Outlook-Broderick area. During the 1966 session of the Saskatchewan Legislature, The South Saskatchewan River Irrigation Act was passed which enables the Lieutenant Governor in Council to establish one or more irrigation districts and to designate the lands to be included. The Act provides for a Board of Trustees, initially, with a majority of appointed members, and the Board is given the responsibility of constructing, operating and maintaining the irrigation works.

A policy of grants and loans for the development of irrigable lands has been prepared. The grants cover one-third of the farmer's land development costs with a maximum Government share of \$35 per acre for work done prior to year 5 of the development schedule. Thereafter the scale of grants is reduced each year. For farmers requiring financing, the Government will loan the full amount and provide annual grants to cover interest charges in the first seven years with principal payments deferred during this period as well. The development policy places a ceiling of \$4.50 per irrigable acre per year for the operation and maintenance charge during the initial 10-year development period.

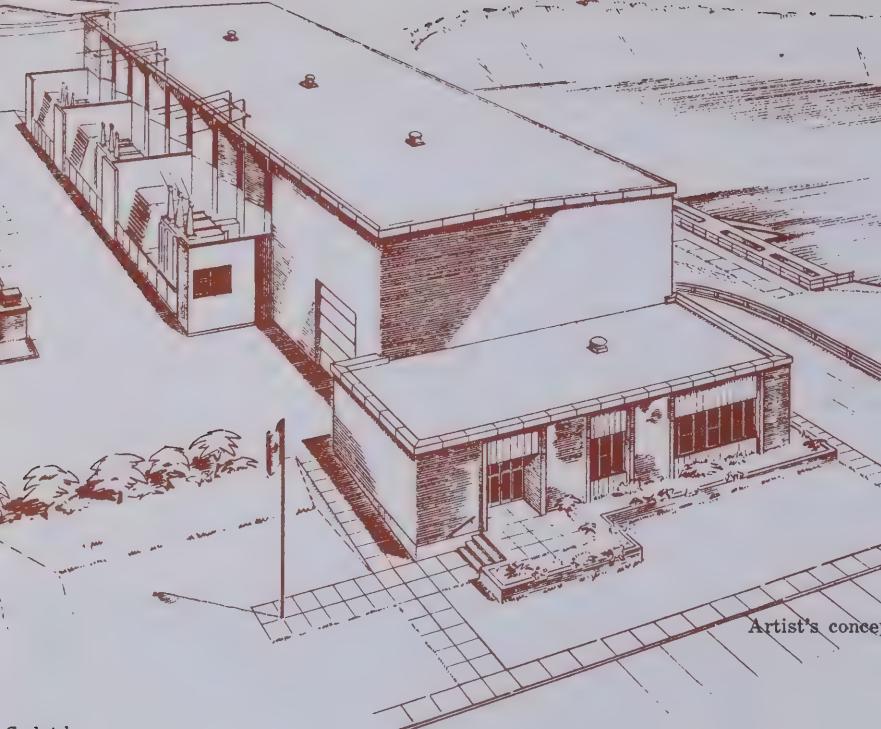
An active extension program is being carried out with interested farmers.

Some farmers have indicated that they would prefer to sell their irrigable land and the Department of Agriculture has purchased some 10,000 acres. A policy for development and sale of this land is under consideration.

Construction is proceeding on the main water supply system to serve the Outlook-Broderick area. Water will be pumped at the main dam from the reservoir into a main supply canal which will serve this irrigation block and the Saskatoon-Southeast Project. A balancing reservoir is under construction near Broderick as part of this distribution system. The construction schedule calls for completion of the pumping plant, main canal and Broderick Reservoir by July 1, 1967, to the extent necessary to convey the water requirements of the Saskatoon-Southeast Water Supply Project. Construction of the irrigation distribution system will be completed for the southern portion of the district in 1967, for irrigation in 1968, and irrigation will commence in the balance of the area in 1969.

## **POWER**

Plans call for the development of the Coteau Creek power plant at the South Saskatchewan Dam in two stages. The first stage, presently under construction, consists of three turbo-generators with a combined rating of 250,000 horsepower. These generators will be located in a power house situated on the downstream toe of the main dam. Three of the five diversion tunnels through the dam have been lined with steel to serve as penstocks to convey water from the reservoirs to the turbines. The estimated cost of this first stage development is \$26 million.



Artist's conception of the Coteau Creek power station

.C. sketch

The second stage will involve the utilization of the remaining two diversion tunnels to bring the ultimate size of the plant to 400,000 horsepower.

The steel liners were placed in the three tunnels in 1961. In 1963, two contracts were awarded for the supply, delivery and installation of three 84,000 horsepower turbines and generators. Tenders were called and a contract let during the year for the construction of the power house and appurtenant works including the installation of the free-standing penstock sections connecting the tunnels to the power house. The construction schedule calls for the commissioning of the two units before the end of 1968, and the third unit early in 1969. Design and construction work is proceeding on the transmission lines to connect this new station to the provincial power grid.

## RECREATION

The South Saskatchewan Reservoir represents a valuable addition to the water-based recreation resources of southern Saskatchewan. This man-made lake will be 150 miles long with a shoreline of nearly 500 miles. It is located in a part of the province where such resources are very scarce indeed. The Provincial Government through the Department of Natural Resources has under way a massive program to develop recreation sites on the reservoir for use by Saskatchewan people and tourists.

Following a series of studies, the Department prepared a long-range plan for development of recreation facilities on this project. The first objective is to have picnic sites, camping facilities, swimming and boat areas ready for public use in the first recreation season of 1967.

Three large areas have been selected for development as provincial parks. These include an area around the main dam, a large area on the north side of the Qu'Appelle Arm of the reservoir, and an area at Saskatchewan Landing south of Swift Current. During the year a development plan for the main dam park area was completed. Since the main dam itself will be the major tourist attraction on

the reservoir, a visitors' center is proposed for construction overlooking the reservoir adjacent to a marina. Camping and beach areas will be located nearby. All structures in the main dam area will have a common architectural theme, featuring an exterior finish of winter-white brick on compatible material with trim of turquoise ceramic tile.

The afforestation program continued in 1965, with nearly 400,000 trees being planted. This ambitious program will transform the typical plains landscape to truly park-like vistas. Good survival rates have been experienced in both the dryland and irrigated plantations.

Keen public interest in cottage development on the reservoir is evident. The Department is proceeding with basic design and survey of cottage subdivisions near Elbow and south of Birsay. The first lots will be available to the public early in 1967. Two further subdivisions will be surveyed in 1967-68.



Sask. Gov't

Trail riding along the shore of Lake Saskatchewan



Area planted to young trees under the afforestation program

The location of the scenic loop road to facilitate travel of tourists from the Trans-Canada Highway has been approved. Future highway improvement in the area will follow this plan.

Construction is proceeding on the first two organization group camp sites on the reservoir. The Saskatchewan 4-H Council is going ahead with a youth training camp, south of Birsay on Hitchcock Coulee. The Girl Guides of Canada plan to develop a summer camp in the same general area. The department assists in the selection of sites and site planning.

Future plans call for the development of an historic-geologic park and boat harbour complex in the Elbow vicinity.

Construction of boat launching ramps utilizing the decking from the construction bridge recently demolished is planned for 1966. These boat launch sites are strategically located near existing provincial highways.

Family camping — a future activity to be enjoyed at designated areas along Lake Saskatchewan's shore



# SASKATOON-SOUTHEAST WATER SUPPLY PROJECT

## Chapter VI

Ninety miles of canals, five large reservoirs and up to 240 miles of water pipeline will be built at maximum development to supply a water-short area east of Saskatoon at a capital and operating cost of some \$20 to \$25 million.

The decision to go ahead with this ambitious plan was made by the Saskatchewan Government upon completion of a feasibility study undertaken by the Saskatchewan Water Resources Commission during 1965.

In its first year of operation, the Investigation and Planning Branch co-ordinated the planning and development of this major study. The idea of building a joint water supply scheme to supply the growing potash industry, municipal, irrigation, recreation and other uses in an area from the South Saskatchewan River to the Quill Lakes was a bold one, which required very careful investigation.

The study taxed the resources of the Commission and a number of other government agencies to the utmost and, incidentally, justified the concept of the Commission as an overall co-ordinating and planning agency and the results exceeded the early expectations.

The study began to take shape before the close of fiscal year 1964-65. By April, 1965, it was clear that the resources of the Investigation and Planning Branch would be fully committed for several months to this major feasibility study. The planning schedule called for three stages or phases with a careful review of project feasibility and planning progress at the end of each phase. In this way the necessary expenditures were minimized, and each step in the work was dependent upon favourable results from each preceding step.

A final report on project feasibility was sent to the Commission in September, 1965. The report consisted of a summary of thirteen studies completed by various agencies along with recommendations. Among the aspects studied were, ground water reconnaissance and evaluation; the cost of demineralizing ground water; the cost of alternative designs for surface supply works; the study of water quality; an assessment of the recreation potential; study of irrigation feasibility; a project benefit-cost comparison and a study of financial feasibility; and administrative arrangements needed for project construction and operation.

It was apparent from this work that significant benefits could be achieved from a multi-purpose water supply scheme in the area southeast of Saskatoon. The Government approved the project in principle in September, 1965, and before the end of the fiscal year, the project was handed over to the Saskatchewan Water Supply Board to design, construct and operate the project.

### PHYSICAL WORKS

Water will be required in the Saskatoon-Southeast area for irrigation, industrial, municipal, recreation, wildlife, and other uses. At maximum development, about 80,000 acre-feet of water per year will be pumped by the irrigation pumping plant on the east side of the South Saskatchewan Dam to supply the Saskatoon-Southeast area. From the east side pumping plant water will be conveyed through the main irrigation canal serving the Outlook-Broderick irrigation block of the South Saskatchewan Project. This main canal terminates at the holding reservoir known as the Broderick Reservoir, which is designed to have a storage capacity of 9,200 acre-feet. From Broderick Reservoir the canal system will extend in a northeasterly direction a distance of some 23 miles to a reservoir on Brightwater Creek, about five miles due west of Hanley. Water would be diverted near the midpoint of this canal to supply irrigation demands for 5,000 acres in the Broderick-East area.

The canal will extend north from Brightwater Reservoir and follow along the south side of Indi Lake for about 10 miles to the proposed Blackstrap Reservoir which will be created around the existing Thressa and Blackstrap Lakes. Blackstrap Reservoir has been designed to have a capacity of about 54,000 acre-feet and will be confined by major dams located at the south end where Highway 11 crosses the Blackstrap Valley and at the north end of the existing Blackstrap Lake. Some 7,500 acres of irrigable land in the Clavet area would be served from the north end of Blackstrap Reservoir.

From the north end of Blackstrap the canal would angle northeasterly for about 15 miles to a point about three miles south of Bradwell. At this point a small auxiliary canal would extend about three miles to the northeast to serve the proposed 2,200 acre-foot Bradwell Reservoir, which in turn would serve Allan Potash Mines and the Town of Allan. The main canal would continue an additional 12 miles in an easterly direction to the proposed Zelma Reservoir lying about one and one-half miles northeast of the Village of Zelma. This reservoir has been designed to have a live storage capacity of some 9,000 acre-feet, sufficient to supply all foreseeable demands in the area east of Zelma during winter. From Zelma Reservoir a system of pipeline is designed to extend east and north to serve towns and villages. Below Zelma Reservoir a canal would be provided to supply the recreation requirements of Little Manitou Lake.

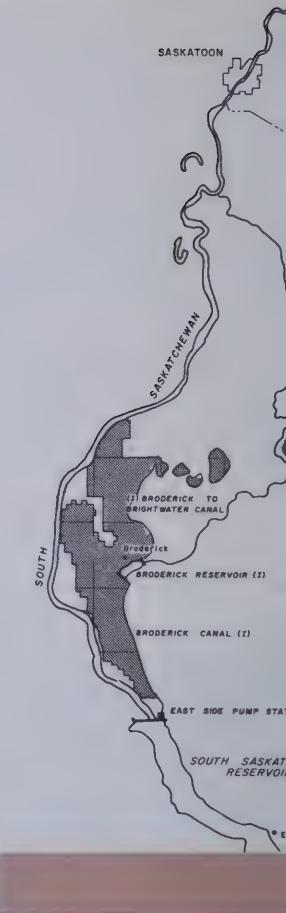
The quality of the water in the South Saskatchewan Reservoir is expected to be around 300 ppm total dissolved solids—a very high quality water. But the extent to which water quality will be impaired by its passage from the reservoir through the canal system was unknown and a special study of possible water quality was undertaken by the Conservation and Development Branch of the Department of Agriculture. Although the results were not wholly conclusive, the study indicated that quality of water delivered through the canal and reservoir system would be within the acceptable limits for the use of the potash industry; towns and villages; and irrigation.

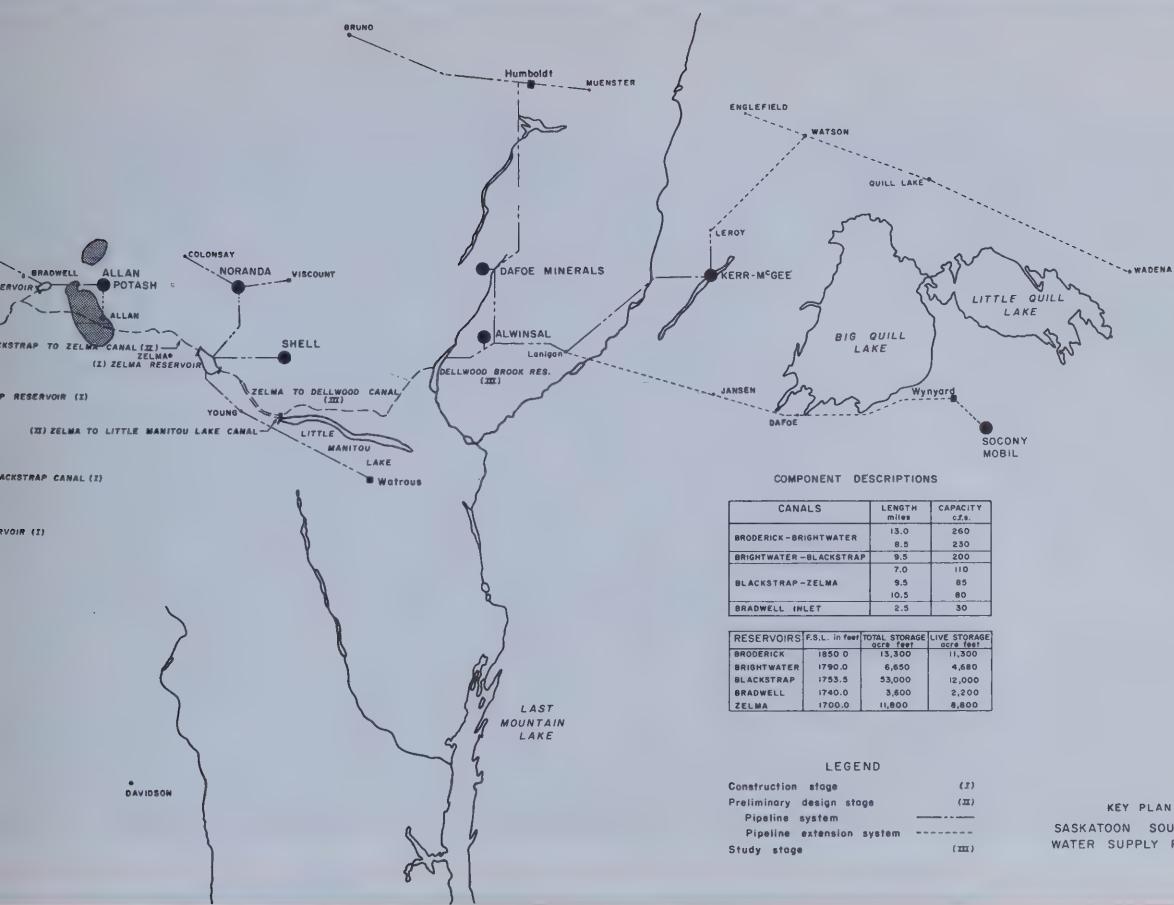
It is expected that the whole canal and reservoir system will be subject to flushing during filling of the reservoirs. Discharge water from system flushing will enter Little Manitou Lake and will contribute toward raising the level of that lake. It is also expected that water quality will gradually improve with the operation of the system and will approach that of South Saskatchewan River water plus some increase over the long-term due to evaporation.

#### *Proposed Pipeline System —*

From Zelma Reservoir, water must be distributed to industrial and municipal users farther east. Surface topography and the elevation of the canal suggested that water be delivered to these users from Zelma Reservoir via a pipeline system. During the summer of 1965, engineering consultants studied several alternatives and selected pipeline routes and sizes.

From Zelma Reservoir a base line may extend due east to the Alwinsal mine site. From that point, a line could extend north to service additional potash plants, towns and villages. The main line could continue in an east-southeasterly direction to the vicinity of Jansen where a line might branch north and then east to service other potash and municipal users. The base line could eventually continue east to end near Wynyard. A separate branch line has been designed to leave Zelma Reservoir and extend north to service Noranda Mines and the villages of Colonsay and Viscount. It may be possible to eliminate a portion of the base line by extending





the canal eastward from a pumping plant near Zelma to a reservoir on Dellwood Brook near Guernsey. This alternative was receiving study at the end of the fiscal year.

The consultants designed a pipeline system which would service all potential users within the area and which would provide complete water treatment facilities at Zelma intake. A first look at costs showed that they may exceed the estimated revenues from municipal and industrial use. The consultants were asked to review the system and redesign it to exclude certain segments which were uneconomical. Some redesign was also undertaken on the water treatment plant so that it is now planned to provide only minimum treatment facilities.

The construction schedule for the proposed gravity canal and reservoir system shows that it would not be possible to complete construction in time to meet the production water requirements of Allan Potash Mines. Arrangements have been made with the company whereby Allan Potash Mines will construct a pipeline from the South Saskatchewan River near Saskatoon to provide an interim supply until water can be delivered through the canal and reservoir system. Allan Potash Mines have agreed to take water from the canal and reservoir system when it becomes available and a part of the interim system will be used to deliver water from Bradwell Reservoir to the mine and the Town of Allan.

## THE DEMAND PICTURE

### *Industrial Water Supply —*

The potash mining industry will be the source of the major industrial demands in the Saskatoon-Southeast area. In a shaft mining potash operation, processing requires about 800 acre-feet of water per million tons of potash produced annually. Most of the water is used in the separation process, where the potash is separated from the common salt.

The only producing potash mine in the vicinity of the planned water supply scheme is that of the Potash Company of America at Patience Lake a few miles east of Saskatoon. This company owns a pipeline to the South Saskatchewan River from which it derives its water supply and was excluded from the demand calculations. By 1968, it is expected that at least three other companies will have completed mines in the Saskatoon-Southeast area. These are: U.S. Borax Company (Allan Potash Mines) located near the Town of Allan; Alwinsal Potash Company, located near the Town of Lanigan; and Noranda Mines Limited, located near the Village of Viscount. By 1985, prospects appear to be good that additional plants will locate in the area served by this water supply system.

The competitive position of Saskatchewan potash producers appears to be favourable both in the North American market and the world market. The high grade of Saskatchewan ore may be a very significant factor in keeping production costs down. It is clear that a tremendous latent demand for potash exists particularly in tropical countries and so-called underdeveloped countries of the world. The key to the expansion of Saskatchewan potash production, in general, lies in the

AMC-Harrison Ltd. Photo



Shaft derricks being constructed at the Noranda Mine in the Viscount-Colonsay area

Photo courtesy Color Productions Ltd.—Reg



Lanigan townsite taken in 1965 showing preparation for expansion

Photo courtesy Color Productions Ltd.—Reg



Lanigan townsite taken in 1966 showing expansion that has taken place due to new industry in the area. Lanigan is situated on the Saskatoon-Southeast Water Supply Project

extent to which the latent demand will be translated into actual demand. While this is a matter of judgment, an optimistic view of future potash mining development appeared to be justified and assuming that the known plans of potash companies are proceeded with, the total annual water requirements of the potash industry in the Saskatoon-Southeast area are expected to be in excess of 3,000 acre-feet by 1970, about 8,000 acre-feet by 1980, and in excess of 9,000 acre-feet by year 2000.

*Municipal Demand —*

In the spring of 1965, the Saskatchewan Water Resources Commission held public hearings in the Saskatoon-Southeast area and contacted all communities that the scheme might possibly serve. It was found that the large majority of communities were experiencing difficulty with their municipal water supply. For example, the Town of Humboldt has an inadequate supply to meet existing needs. Other communities are using water of inferior quality.

Population forecasts were prepared which indicated that the communities currently requiring water contained a population of some 14,000 people; by year 2000, this is estimated to rise to 43,000 people. It was assumed that a rapid expansion in per capita demand for water would take place in the area when South Saskatchewan water is available. Municipal water demand is expected to increase from about 500 acre-feet by 1970, to about 3,250 acre-feet by year 2000, as a result of these two factors.

*Irrigation —*

About 15,000 acres of irrigable land located in four separate blocks can be serviced by the Saskatoon-Southeast Water Supply Project. The areas under consideration were first studied several years ago by the provincial Department of Agriculture. It was concluded at that time that the cost of providing service on a

Furrow or row irrigation of a vegetable crop —  
showing water being released into furrow trenches from a supply trench





Sprinkler system irrigation—  
showing water being pumped  
from supply trench

single purpose basis would be too great to justify the extension of the canal system from the east side irrigable block of the South Saskatchewan Project. The concept of supply via a multi-purpose system materially altered the status of these irrigable areas.

Four main blocks of irrigable land have been identified, the Broderick Extension area, the Brightwater area, the Clavet area, and the Allan area. Soils in these areas compare favourably with those in the Outlook-Broderick block of the South Saskatchewan Project and there is good overall slope and topography. The four areas noted are those which are known at present and which are in close proximity to the proposed canal, but the potential for irrigation may not be limited to these blocks. Considerable interest has been shown by farmers and small water users along the canal and reservoir route. It appears that this kind of small irrigation development may be a bonus of the project.

#### *Recreation —*

Two areas with major recreation potential were identified — Blackstrap Reservoir and Little Manitou Lake.

Recreation possibilities along the shores of the reservoirs to be created by the SSEWS project

Sask. Gov't Photo



Primary route surveys for the canal system from the Broderick irrigation area to the Saskatoon-Southeast area showed that a reservoir could be created in the Blackstrap Valley which would contain some 54,000 acre-feet of water. Blackstrap Reservoir is considered to have a high recreation potential, provided drawdown on the lake is kept within reasonable limits. During the summer of 1965, a recreation consultant evaluated the benefits and costs of a development on Blackstrap. Results showed that the primary benefits of Blackstrap development would exceed the costs of development by a substantial margin.

Little Manitou Lake is one of the most saline lakes in the world. The lake has long been a centre for recreation because its saline qualities permit very safe swimming and the water is held by some to have therapeutic qualities. Natural drainage and average annual runoff into Little Manitou Lake have been insufficient to maintain adequate water levels for recreation during the past 20 years or so. Lake levels have been falling almost continuously and the lake is now estimated to be some 10 feet below optimum recreation level. Preliminary engineering reconnaissance established that 7,000 acre-feet of water would be required to raise the lake level to an elevation acceptable for recreation use. Once lake levels have been raised, approximately 4,000 acre-feet of water annually will be required to replace evaporation and seepage losses and to maintain lake levels at a desirable elevation for recreation.

The consultant found that the immediate market area for the recreation facilities to be provided by Blackstrap Reservoir and Little Manitou Lake contains a population of about 150,000 people. He estimated that this will increase to 175,000 by 1970, and 428,000 people by year 2000. The rapid increase is largely attributable to the very fast growth of the City of Saskatoon. The consultant felt that the Blackstrap and improved Little Manitou developments would not create an excess of outdoor recreation resources in the region and would not significantly affect existing investment at other provincial and regional parks in the area.

The consultant estimated that between the years 1970 and 2000, just over 10 million day-use visits will be made to the recreation facilities created at Blackstrap Reservoir and Little Manitou Lake. This estimate of visitor-days is considered to be conservative. In addition, he suggested that total camper-days for the same period will be in the region of 300,000 and that by year 2000 there may be one thousand cottages on the shorelines surrounding the water bodies. An enormous backlog of demand for cottage development sites exists in Saskatoon and adjacent areas and the consultant felt that Little Manitou Lake and Blackstrap Reservoir would be an important supplemental source of cottage sites to the South Saskatchewan Reservoir.

#### *Wildlife —*

Studies by Ducks Unlimited were initiated in the spring of 1965 to identify marshes which might be suitable for development as waterfowl production areas if water levels could be maintained during the production season. It has been found that wetlands should be maintained until at least August 15 in any year for best waterfowl production, by which time the majority of waterfowl are able to fly to secure waters.

The wildlife benefits of the Saskatoon-Southeast Project fall into two distinct groups, the production potential of wetlands and the hunting benefits resulting from fall waterfowl concentrations on project reservoirs. The Ducks Unlimited



Sask. Gov't Photo

A typical wild waterfowl habitat similar to those to be created along the SSEWS project

reports suggest that wildlife schemes could be developed to produce close to 100,000 birds annually throughout the project lifetime. This production potential is small in comparison with the production potential of the province as a whole, but the creation of permanent water areas adjacent to the City of Saskatoon would have significant benefits. All the wetlands under consideration are within 40 miles of the City of Saskatoon and are ideally situated as new hunter resources. Hunting pressures in the Saskatoon area are already very heavy and with large anticipated increases in population, these pressures will undoubtedly become more serious in future years.

Current evaluation practices in United States do not provide any guidelines for the monetary evaluation of waterfowl production potential. An analysis of the costs of producing 100,000 ducks annually from the Saskatoon-Southeast scheme suggests that the cost of production will be in the region of 10 cents per duck. Against this cost of production, must be set the benefits of 100,000 new waterfowl annually and the value of waterfowl hunting, which has been estimated in the United States at between \$1.50 and \$4.50 per visitor-day.

#### *Other Purposes—*

A number of other demands were considered during the course of the feasibility study including domestic uses, stockwatering, small community and individual irrigation schemes, and community pastures. No attempt was made to evaluate the primary benefits of these purposes and these purposes will be a bonus to the scheme and perhaps a substantial bonus. This kind of demand does not develop until construction is well advanced and individuals become aware of the presence of the project. While the benefits of such a service may be substantial, the incremental costs of providing such services are small.

#### *Other Benefits—*

It is becoming more and more apparent that some indirect project benefits may be of considerable importance. For example, the presence of adequate water supplies from the Saskatoon-Southeast Project may have some bearing upon future expansion plans for potash plants currently under construction or under consideration. Conceivably, inadequate water supplies could place limitations upon the number of plants in the potash production that could be derived from this Saskatoon-Southeast area.



The federal pre-development farm at Outlook. Established in 1949, the farm serves as a proving ground for irrigation practices in the heart of the area selected for irrigation

The potash industry is generally not one which attracts a large amount of secondary industry. On the other hand, the availability of water supplies suitable for almost any industrial application will undoubtedly assist industrial development. The provision of adequate water supplies to many communities would be a positive stimulus to industry in an area which has lost industry in the past due to water supply problems. The provision of water supplies that are of good quality and reliable quantity will attract population to communities in the area and will strengthen the tax base of many of the towns and villages.

The magnitude of the Saskatoon-Southeast Project is such as to ensure added impetus to construction and a substantial increase in employment during the period 1966 to 1968. Construction of the canal system and pipeline system will give a lift to an already thriving provincial construction industry. Many scores of persons may be directly and indirectly employed by the expenditures resulting from construction of the project.

#### *Comparison of Benefits and Costs —*

It soon became apparent that with a project of this magnitude, the decision whether or not to invest by the government should be carefully studied and the benefits of the projects assessed in the light of the costs. The work of economic comparison was carried out after completion of the studies of the individual purposes and after the costs had been estimated. The task of drawing together all the available economic information and ordering it into a benefit-cost comparison fell to the Economics Division of the Investigation and Planning Branch.

The comparison was made on the basis of the costs and benefits determined in the feasibility study and it is already apparent that as design proceeds and costs and demands change, the economics of the scheme must be kept under constant review.

The results of the benefit-cost comparison for the overall project were positive despite the fact that certain benefits could not be evaluated in dollar terms and in spite of the inclusion of all secondary benefits and considerations.

Each of the purposes was examined in turn and the benefit-cost ratios resulting were greater than 1 to 1 over a thirty year life period, except for the irrigation purpose which showed a positive ratio over the lifetime of the physical works. The benefits of industrial and municipal supply were evaluated in terms of monetary revenues from the sale of water. The benefits of the other purposes were evaluated in terms of simulated monetary values.

#### *Financial Status —*

In any multi-purpose scheme some costs are clearly identifiable as being necessary to supply water to a particular purpose. Other costs are incurred to provide facilities which are common to several or all the purposes served. The former costs are described as separable costs and the latter costs are described as joint costs. After the separable costs have been allocated to the purposes to which they serve, the joint costs must be split among the various purposes served by some equitable method of allocation. A common way to do this is to divide the joint costs in proportion to the volumes of water supplied through each segment of the system to each of the various purposes. This method was employed to allocate the joint costs of the Saskatoon-Southeast Project.

The joint costs of the physical works consist of those costs of the canal and reservoir system which could not be specifically assigned to a particular purpose or purposes. The costs of the pipeline system were specifically allocated to the municipal and industrial purposes and were divided between the two in proportion to the physical capacity provided for each.

Some purposes are expected to be revenue-producing and reimbursable and others are expected to be non-revenue-producing and must be treated as non-reimbursable. That proportion of the costs allocated to municipal and industrial uses are expected to be fully reimbursable. As a result, it is expected that revenues from charges against municipal and industrial users will repay the capital costs allocated to these purposes plus interest on the investment within the project repayment period. On the other hand, the costs allocated to irrigation, recreation, wildlife and other purposes are expected to be either fully non-reimbursable or partially reimbursable. In any event, it is expected that the annual costs of operation and maintenance allocated to these purposes will be recovered through charges against the beneficiaries.

#### **STAGING OF THE STUDY**

The work outlined above represents a summary of the planning activities undertaken during the summer of 1965, by the various agencies involved. In fact, the amount of work needed and contributed by those people in organizations working on the study was far greater than any summary could suggest. As noted earlier, the work was undertaken in three stages but as work proceeded it became clear that consideration of the results of Stage II studies alone would not be too

meaningful. Since it was imperative that the entire investigation be completed by mid-September, studies originally proposed for Stage III were also being done during the Stage II work.

In Stage I estimates were made of existing and future potential water demands for all purposes including, industrial, municipal, irrigation, recreation, wildlife and other aspects. A preliminary evaluation of four basic schemes to supply water to the area was undertaken and the most promising schemes selected for further study during Stage II on the basis of relative cost.

During Stage II the information on water demands was further refined and a detailed cost analysis of selected schemes was prepared. The prospective direct and indirect benefits of the various uses included in the multi-purpose proposal were evaluated, and wherever possible, measured in monetary terms.

In Stage III the Commission prepared a benefit-cost comparison and analyzed the financial feasibility of the proposal. The enormous mass of information and data collected was then summarized and conclusions and recommendations prepared.

In mid-September, 1965, the summary report was submitted to the Commission for review and consideration. As a result of the Commission's study, certain recommendations were made to the Government and during September, the Government considered these recommendations, the implications of the scheme, and the benefits to be obtained therefrom. In October, 1965, the Government decided to proceed with the scheme and the Saskatchewan Water Resources Commission was directed to continue work towards the design level.

Since October, negotiations have taken place between the Saskatchewan Water Resources Commission and several of the potash companies, and arrangements have been made for interim supply to Allan Potash Mines. As a result of the report by the Budget Bureau on administrative arrangements, the Saskatchewan Water Supply Board was structured and arrangements made for the Board to be set up early in 1966.



# SASKATCHEWAN'S WATER RESOURCE IN NATIONAL PERSPECTIVE

## Chapter VII

Saskatchewan is fortunate to have a large supply of fresh water but the greater proportion of this available water is located in the northern half of the province. Our industry and population is concentrated in the southern half of the province. The Saskatchewan River System provides the only assured major source of supply for this southern area. Those parts of southern Saskatchewan outside of reasonable distance from the Saskatchewan System depend on storage reservoirs which capture the spring flood waters on streams with intermittent flows. The available supply in some of our southern basins is approaching full allocation.

The creation of Lake Saskatchewan on the south branch of the Saskatchewan River offers exciting possibilities for the diversion of large quantities of surface waters into other parts of southern Saskatchewan. It makes possible direct diversion into the Qu'Appelle System — the source of water for two of our major cities and the location of a number of fine recreation lakes. The Saskatoon-Southeast Project will permit diversion of water for irrigation, industrial, municipal, recreation and wildlife use in a large water-short area in central Saskatchewan. It is quite possible that future diversion schemes will involve the transport of South Saskatchewan water as far south as Estevan.

The Saskatchewan River System is an interprovincial stream with its headwaters on the eastern slopes of the Rockies and it drains a large surface area in Alberta, Saskatchewan and Manitoba before being discharged via the Nelson River into Hudson Bay. Thus, the use of water in the basin is the concern of all three provinces. The Prairie Provinces Water Board was established in 1948 to advise the governments of the Prairie Provinces and Canada on the allocation of water in the Saskatchewan River System and to recommend an equitable division of these waters among the three Prairie Provinces. Allocations have been made from time to time for specific projects, but no final agreement has been reached on overall apportionment of the waters.

The day may not be far away when the waters of the Saskatchewan System will be fully allocated for use. Each province is looking independently at diversions of northern waters in order to augment supplies in the south. Due to the geography of the whole prairie region, diversions most helpful to Manitoba's needs can be made most economically in Saskatchewan. Similarly, diversions in Alberta can be helpful both to Alberta and Saskatchewan. Eventually, diversions of waters from Arctic rivers may be required. Therefore, we have the situation where action taken independently by one jurisdiction could have adverse effects on users in other parts of the prairie region. Joint study and joint development, on the other hand, could reap great benefits for the Prairie Provinces and Canada as a whole.

It is evident that the United States is facing a serious water shortage. It is estimated by Leo Cherne, Executive Director of the Research Institute of America, and he is far from alone in his predictions, that by 1980 the United States will use all the natural water available within its boundaries — 2 million acre-feet per day — and should the present rate of increase in use continue, that the consumption rate will double by the year 2000.

Alternate methods of water management in the United States could improve the use of natural water there. Great quantities of fresh water are used in that country to dilute effluent from industries and cities. Equally great quantities are used for irrigation. Pollution control programs are expensive and there will likely be opposition to any large-scale reduction in acreage under irrigation. These facts



FIGURE 3

have prompted influential people in the United States to look outside their borders for additional supplies of fresh water. Many unofficial proposals have been made for projects which would transport Canadian water to water-short areas in the United States. The advocates of these proposals recommend joint study by the two countries. This adds a complicating factor to our water resource planning and allocation in Canada.

Canada's vast quantities of fresh water represent a strong incentive for the location of new industries requiring large quantities of water in their processes. Canada does not possess at this time firm estimates of its future water needs nor does Canada have a complete inventory of its useable national waters. Consequently, our knowledge of alternative development programs to utilize Canadian water in Canada is severely limited. The increasing water problem faced by our neighbors and our own lack of information strongly suggest the need for an early and concerted study of our water resources and our future requirements by Canadian investigators.

It is desirable that a systematic approach to the question of water inventory and future use alternatives be implemented on a river basin regardless of local and provincial boundaries. Such an approach will bring all concerned closer to the goal of optimum use of our national waters. Canada should entertain proposals for discussions with the United States only when both the inventory and use studies are complete. Until we are in a position of knowing what our water requirements are and until water use plans are developed by Canadian authorities, we must be very cautious, indeed, about any proposals to export this vital resource no matter how beneficial it would appear to be to our two nations.

Saskatchewan took the initiative in proposing joint study of the Saskatchewan-Nelson Basin. Discussions with the Governments of Canada, Manitoba and Alberta have progressed to the point where it appears that a joint study will commence soon. The proposed three to five year study will assess the water available in this basin and will pinpoint the costs associated with diversion schemes to augment flows at various points in the basin. This study should identify development projects that will provide great benefit to the whole region. Similar studies are required for all major river basins in Canada.

While it is desirable to measure our overall water resources on an interprovincial basis and to develop projects of joint benefit, the individual provinces need to know what water will be available for their internal use. The use of water within the provincial boundaries should be entirely a matter of judgement of the particular province provided that its use does not unduly interfere with use in other provinces. The Commission believes that there would be great value in an equitable apportionment of waters in our interprovincial streams. Such apportionment would make it possible for each province to plan its internal developments in such a way as to encourage maximum provincial benefit. The supply of fresh water in the Province of Saskatchewan is a valuable resource. This resource can be enhanced by interprovincial and, indeed, national development projects. The fullest co-operation between provinces is required to achieve optimum use. Within Saskatchewan much work can be done to effect better utilization of this resource. The effective planning, development and use of this vital resource may represent the major challenge to our citizens over the next quarter century.

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